

General introduction to the techniques of information and documentation work

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of information and documentation work**

Preface

In developing countries, the organization of efficient library and documentation structures is being held back largely by the absence or shortage of trained staff.

Certain states, aware of the potential contribution of information specialists to their development have, in conjunction with international organizations such as Unesco, concentrated their efforts on the establishment and development of training facilities. Meanwhile, Unesco has been especially concerned with producing and disseminating study manuals adapted to the particular needs of these countries and to the level of the readers for whom they are intended.

Notwithstanding these efforts, there are still many needs to be met: in most developing countries, the units concerned with librarianship and documentation are run by personnel who have received no special training. The task, then, was to provide for all those who, embarking on a career in this field, search in vain for a straightforward textbook that would offer them a clear view of their future mission and its importance.

In seeking to fill this gap, Unesco entrusted the preparation of this manual to two specialists with great experience in this field, who received generous and valuable support from a wide variety of their colleagues.

The present publication is primarily conceived as a general introduction to the techniques of information work. The purpose and intended readership explain the manual's deliberate simplicity of vocabulary, unity of presentation and arrangement in a modular form. It is our hope that it will serve as a handbook which will succeed in strengthening the motivation and improving the skill of those beginning or pursuing a career in a library or information unit without the necessary basic training.

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Foreword

This manual is intended for all those who, in developing countries, begin their careers in information units without any basic training in information science and techniques, though with a general qualification equivalent at least to the completion of secondary education, and who may be asked to perform various more or less specialized tasks. Its aim is to help them perform this work more effectively by providing them with a practice on all present-day activities connected with information which is, we hope, comprehensive, well organized and easy to consult.

More particularly, this manual should enable them to:

Grasp the essential purpose of the activities they are asked to perform and see how they are related to the full range of means used to ensure the flow of information.
Find a description of the various operations, instruments and concepts related to information systems sufficiently detailed to serve as a guide.

The aim of this introduction is to prepare the reader for specialized in-service training or special courses. The authors emphasize that it can in no way replace the basic training which everyone working in an information unit should at some time or other receive; it is simply a short-term remedy for the weaknesses occasioned by the lack of training.

The manual is not intended to teach the skills needed to perform particular tasks but simply to explain them and set them in their context. It is the job of in-service training, specialized courses and basic training in information science and techniques to develop practical competence.

The present authors, however, not wishing to confine their exposition to material questions alone, have tried to bring out their social utility and interest for people beginning a career as information specialists. It is our hope that this work will strengthen their motivation and open up for them attractive professional prospects.

The manual is designed as an instrument of self-training, to be used by the individual on his own. Nevertheless, it could conceivably be employed in information units or in colleges of information science as a reference work for training courses, as a guide for the preparation of courses or as a means of checking background knowledge prior to a course of specialized training.

The authors have concentrated on contributing to the preparation of personnel working in computerized information systems, but have tried to cover all the techni-

ques related to information. In doing so, they have found it difficult to strike a perfect balance and they would be greatly surprised if they have entirely succeeded.

They are equally aware of having occasionally imposed their own views while attempting to present, in as coherent and organized a manner as possible, a field of knowledge which is still in many respects seeking its way. They came to the conclusion that, for their readers, unity and simplicity were more important than controversial discussion.

Another feature of this manual is that it is arranged in modules: after a general introduction to the various aspects of information activities, it offers a series of specialized chapters dealing with the various aspects of information systems. Each chapter or group of chapters can be used separately to introduce a particular course of activity. This explains a certain amount of repetition that will doubtless be noted from one chapter to another.

Each chapter, moreover, has been planned for separate updating and for the local addition of appendices to reflect the specific conditions of users. They are followed by a few questions to help the reader to make sure that he has fully grasped the essential points. Some basic works have also been listed at the end of each chapter as a guide to further reading; apart from those published in English, they proved very difficult to select on account of the scarcity of elementary works, the poverty of the literature and the generally heterogeneous nature of specialized texts.

The idea for this publication was first suggested at a meeting between those responsible for the training programmes of INIS, AGRIS and UNISIST. They had observed that the level of general knowledge about information and documentation varied widely between participants in their training seminars despite the care taken in the selection and preparation of trainees.

The same problem had been noted during national training courses in information units. These units, moreover, often have to recruit staff with no training or experience in information.

It, therefore, seemed desirable to produce an introductory work which would pay special attention to these needs and which could be disseminated in languages with very few publications on information science.

A detailed plan for the work was drawn up by Mr Michel Menou, under a consultant contract with Unesco, in collaboration with Mrs Binggeli for INIS, Mrs Martinelli for AGRIS and Mr J. Tocatlian for UNISIST. Unesco then entrusted the drafting jointly to Mrs Claire Guinchat and Mr Menou, who continued to have the help and support of the above-mentioned persons and were aided by many fellow specialists, in particular the members and experts of the ad hoc Committee on Education and Training Policy and Programme, Mrs G. Adda, Mr M. A. Gopinath, Professor S. I. A. Kotei, Professor J. Meyriat, Professor W. L. Saunders, Professor V. Slamecka, Dr F. Wolff, Mr A. Abid, Professor A. Neelameghan, as well as Mrs A. Basset, Miss M. Bonnichon, Professor H. Borko and Miss D. Saintville (who worked on the drafting of certain chapters).

The authors would like to express their gratitude to all those who helped them

in this difficult undertaking, but they alone are responsible for any errors, omissions or shortcomings that may remain.

Although the work turned out to be a major challenge, they hope that this introduction will help their new colleagues in developing countries to begin their professional careers with a clear view of the nature and importance of their tasks, so that they will perform them effectively with interest and enthusiasm.

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Paris

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Michel MENOU

Introduction

'Communication' and 'information' are without doubt two key words of our time. Any human relationship or any activity implies a process of communication. All knowledge begins with information on what is happening or on what is being said, done or thought. This fact determines, and has always determined, the nature and quality of human relationships. What is new today, however, is the scale and development of this phenomenon, and the amount of attention now being paid to it. Interpersonal communication has been supplemented by mass communication, distinguished by the amount of information transferred and the size of its public. Since this information is carried by the mass media—newspapers, radio, television—it escapes the direct control of the user, who is unable to check it, change it or give an immediate response. Between these two extreme forms of communication—direct person-to-person communication and indirect communication between the public and medium—all areas of human activity are provided with a whole series of institutions with the capability and duty of communicating knowledge, including the family, the education system, the professions, the system of administration and so forth. Some of them are specialized in the functional processing of scientific and technical information from source to user.

The fact is that direct human communication is dependent on time and space. It can only be durable if it leaves a trace, if, that is, it is recorded on some form of carrier: book, image, photograph, sound record, etc.; in short, a document. The purpose of documentary activities is to select, within the mass of information carried by these means, the pieces of knowledge required, to make them available to anyone who might need them at the time when this need arises, and to keep them intact yet always up to date.

Communication takes extremely varied forms but the general pattern remains more or less the same. The principle underlying all communication is the circulation of a message between a source (emitter) and a target (receiver) by means of a carrier (channel) (Fig. 1).

The emitter, or source, may be an individual, a group of people or an institution. As we are concerned with intentional emissions, the emitter expresses the idea he wishes to communicate in a form that can be understood by the recipient. This is known as coding. For example, a French speaker addressing, orally or

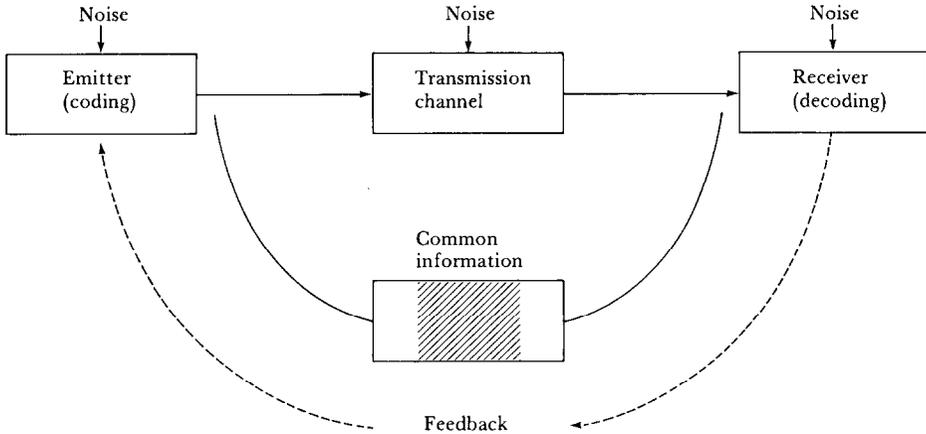


FIG. 1. Circulation of a message.

in writing, other French speakers would use the resources of French; an engineer with the job of planning a road would use the standard international road-signs that everybody understands and so forth.

The target, or receiver, is the person who receives the message. Reception, however, is not always intentional: unlike the emitter, the receiver is far more influenced by the flow of messages coming from all directions and not intended for him than the producer of information, who has merely to express himself. To understand the message the receiver has to sort out the relevant signals from the mass of information reaching him, decode these signals (in our examples, the French language and the highway code) and identify the original message. The message flowing from emitter to receiver—data, ideas, signals, etc.—can only be understood if both share a common stock of signs (the code), which they both understand in exactly the same way, or if a translation is made from the language of one to that of the other. Yet, even where there is a common system, two types of distortion frequently occur: the initial coding of the message and the interpretation given on receipt do not always reflect its real content. The words do not say what was meant—and the emitter and receiver misunderstand each other. The consequent loss of meaning may result in less information ('silence') or in the useful information being jumbled with superfluous data ('noise'). In either case the quality of the information suffers, the process has to start again from the beginning, and time has been wasted.

The channel, medium or carrier of the communication varies with the type of communication involved. There are in fact a great many: the vibrations of the air produced by the sound between two people talking, radio waves, the fingers of the hand, artificial satellites and paper are some of the many means of communication.

The general way in which communication takes place is less straightforward than appears. Transmission can be affected by distortion and loss of information. The institution carrying out the information transfer may be responsible for

certain obstacles, others of a technical nature may be due to the processing and transfer procedures; certain social or psychological problems stem from the relationship between users and information specialists, while others derive from the ideological and political context.

Nor is communication a one-way process. The receiver usually reacts to the message by sending a message in return. This reaction to the message is called 'feedback' and may take a great variety of forms: rumour, correspondence, formal answer, critical comment (such as criticism in the press), the form and nature of the response depending on the form and nature of the communication. Feedback, moreover, carries a twofold message: To what extent has the query been satisfied? From what point of view was the answer inadequate? The study of feedback makes it possible to gauge how the message was received and hence constantly readjust the communication process so as to achieve the optimal result of a perfect match between the information sent and the information received. The closer the emitter is to the receiver, or the more thoroughly their contacts have been studied, the more feedback will become a true response. But even when the emitter seems a long way from the receiver—as in a television broadcast or public speech, for instance—transmission is not in one direction only and still produces feedback. Many different means, such as opinion polls, surveys and analyses of needs, have been developed to examine and weigh up the nature of this feedback.

Communication is a young science which has developed from a number of different disciplines, taken various directions and established several explanatory models of communication: the mathematical model of Shannon, the sociologically oriented linear model of Lasswell, the cybernetic model of Moles, the message-centred model such as that of Katz revised by McLuhan, Schaeffer's study of the 'communication machine' and Scarpit's theory of information are all scientific attempts to provide a theoretical basis and examine the new conditions of communication introduced by the technological innovations and scientific advances characteristics of the present age and by corollary, the demand for information.

Today, science dominates the lives of all mankind, and its vital element—information—is of great importance for the world. All economic and social progress depends on the transfer of scientific and technical information. The fact is that technical advances, which help to increase productivity and the national wealth, rely on two fundamental factors: innovation and the improvement of the subsequently employed processes and methods. These factors of development, the product of scientific research, can only be practically applied if discoveries are accessible. Here, any delay or any gap in information means stagnation and even regression.

To be informed is to be in a position to analyse a situation, find solutions to administrative or political problems and make sound judgements. Reducing the amount of uncertainty naturally leads to better decisions which determine, by the succession of choices made, the future of a sector, activity or country.

In addition to the pedagogical relationship linking teacher and student, the process of teaching, learning and acquiring competence calls for stocks of documents

and tools for exploiting and disseminating knowledge, that is, for libraries and other information units. The rapidly increasing demand for education in a growing number of countries, the obligation for a widening range of professional staff to update their knowledge by means of continuing education, and the rising level of qualification required by the scientific advances of today all demand more and more of these factors of development.

The aims of the various channels linking the producer to the user of information are to transform the findings of research into applications that will benefit the individual—in the field of health or food, for instance—enable a person to improve his understanding and control of his surroundings, and provide the industrialist, shopkeeper or farmer with the factual information on which he can base his decisions.

The fundamental point is that science feeds on science. If the information that has accumulated with time were no longer available to the scientific community, scientific discoveries and technical innovations would lose ground and probably disappear altogether. Indeed, this is one of the reasons why the scientific and technological performance of countries with extremely few documentary resources is so low.

The fact is that the production of information and its underlying scientific network are not spread evenly throughout the world. Many developing countries produce scarcely 1 per cent of world scientific literature, which is still largely concentrated in the major industrialized countries with the means to devote a large proportion of their national income to research, education and information. Virtually all these countries possess an information infrastructure that can cater for a great many users: libraries, documentation centres and information analysis centres, specialized staff, institutionalized professions and training, communication channels linking sources and users, and a national policy. Almost all of them are now proceeding to reorganize these structures on more rational and functionally integrated lines through various forms of national and international co-operation agreements.

In developing countries the situation is quite different. The resources they are able to devote to scientific production and the information transfer network are still in general far from sufficient. In most cases their information infrastructure is weak and based largely on libraries, some of which are in fact among the oldest in the world and possess very rich ancient collections. Their shortage of specialists—and not just in advanced techniques—leaves an almost complete void between the top managerial level and the executive personnel, thus blocking the intermediate links in the transmission of information at a time when needs have never been so urgent and the demand is pressing.

The problem of these countries is to reduce the 'information gap' inherent in a low scientific potential and limited facilities for scientific production by gaining ready access to data available elsewhere rather than by increasing the local production of such data, at least initially. For this, two conditions have to be met: the existing national infrastructure must be sufficiently developed and the highly

industrialized countries must play a full part in the system for transferring knowledge to developing countries.

There have been considerable efforts in this direction. Over the last few years in particular a worldwide programme on scientific information (UNISIST) has been set up under the aegis of Unesco and a whole series of national and international organizations. Its purpose is to strengthen and co-ordinate world co-operation in the field of scientific and technical information, especially in the direction of the developing countries. Dealing mainly with practical problems, UNISIST is neither a centralizing agency nor a formal structure but regards itself as a world movement whose mission is to improve information transfer in three directions:

(a) the *availability* and *accessibility* of scientific information, with a special emphasis on the difficulties arising from objective differences between more or less developed countries, as well as other institutional factors; (b) the *connectibility* and *compatibility* of information systems, through an increased use of common standards and modern communications technology; (c) an increased *selectivity* and *flexibility* in the handling and distribution of scientific and technical information, calling on new institutional mechanisms, under the responsibility and with the active participation of scientific organizations.¹

The 'documentary explosion': this form sums up well the spectacular increase in the production of documents throughout the world over the last few years. A few figures will help to illustrate the extent of this phenomenon and the present trends.

The production of periodicals rose from some 10,000 titles at the beginning of the century to 170,000 in 1971. Book production more than doubled between 1965 (269,000 titles) and 1974 (571,000 titles) according to Unesco figures.² In 1970, more than 6,000 documents were published on each working day, or some 2 million in the course of that year, and it is forecast that there will be four or five times as many by 1985, when between 8 and 10 million printed scientific and technical documents are expected to appear, and this includes printed documents only.³

This is, of course, a very rapid rate of increase. The rate, moreover, has continued to accelerate in recent years: from 9.5 per cent during 1960 it reached 10.6 per cent in 1971 and, contrary to certain predictions of saturation and slower growth, is continuing to rise more and more quickly.⁴

The main reason for this is the spectacular development of modern science and technological innovation, which can be illustrated by a strong if not entirely faithful image. According to the American National Education Association,

1. Unesco/UNISIST, *Study Report on the Feasibility of a World Science Informatic System*, p. 133, Paris, Unesco, 1971.
2. *Unesco Statistical Yearbook 1976*, p. 581.
3. G. Anderla, *Information in 1985. A Forecasting Study of Information Needs and Resources*, pp. 14 and 19, Paris, OECD, 1973.
4. *Ibid.*

it took until 1750 for man's knowledge at the time of Christ to double. The second doubling was completed 150 years later in 1900. The fourth doubling of all man's knowledge took place in the decade of the 1950s. Looked at another way, technology has multiplied by ten every 50 years for over 2,800 years. In 1950, there were one million scientists and engineers in the world; in 1900 there were 100,000; in 1850, 10,000; and in 1800, 1,000.¹

In fact, the number of scientists and research workers, who represent the principal source of scientific knowledge and information, is steadily rising and may possibly have reached 10 million by now.² Moreover, in addition to the scientific community itself, there now exist a whole range of other users such as administrators, managers, industrialists, lawyers, politicians, educationists, etc., who are not just users but also increasingly the producers of new information. The increase in supply has quite naturally been matched by an increase in demand involving in one way or another all those concerned with the 'knowledge industry', that is, with the production, distribution and consumption of knowledge. It may be stated as a principle that 'any transfer of knowledge is equivalent to a transfer of information and vice versa'³ and that the knowledge industry, whose essential function is to organize this transfer of knowledge/information will continue to grow rapidly in a world that is based on scientific progress.

This has an obvious impact on the composition of the documentary stock. The books and periodicals published by the traditional commercial networks are supplemented by a wide range of all sorts of unpublished documents for limited distribution, such as reports, theses, congress proceedings, instructional material, studies, preprints, etc., which make up what is called 'non-conventional literature'. They are issued by all sort of bodies—scientific institutions, universities, planning and research units—whose activities and concerns they reflect: being fully aware of scientific developments, they often represent the most recent and up-to-date source of information in the field concerned and the most important channel of direct communication between scientists. Although it is impossible to give figures, their number is known to be increasing considerably at present.

The congestion is made worse by an extraordinary reduction in the useful life of documents, that is, by obsolescence. In some fields, knowledge is renewed so quickly that a book might be considered out of date by the time it is published. Constant updating of the documents in stock is therefore required, and this means dealing with them again and again, either manually or by computer.

In addition to the mass of paper documents, 'non-book material' is produced, i.e. sound records, photographs, magnetic tapes, video tapes, etc., which use a carrier other than paper. Their appearance in the circuits of communication has had a major impact on our society since they marked the arrival of audio-visual media. Though bound for a prodigious future, they raise problems of processing and dissemination that need special techniques and varied channels.

1. Quoted in UNISIST, *op. cit.*, p. 11.

2. Anderla, *op. cit.*, p. 66.

3. *Ibid.*

To cope with this ceaseless flow, information-handling organizations have developed in three directions: expansion in size and number, diversification and specialization, and adoption of new techniques. Where expansion is concerned, some of the major libraries are now gigantic: the French National Library has 16 million documents, the Lenin Library in Moscow has 28 million and the Library of Congress, the largest in the United States, now has 72 million, having doubled the stock it held in 1955 in the space of twenty years.

Diversification and specialization have led to the splitting up of functions, of groups of people catered for, of products offered and of sectors covered. Completely new bodies have been set up, such as data banks and data bases, which store information on an unprecedented scale. Finally, the techniques employed have been transformed.

The documentary explosion has been accompanied by a technological explosion mainly in three areas related to documentary operations: computerization, telecommunications and micropublishing.

The electronic data processor, or computer, for the handling of information is a very recent development which dates back hardly more than twenty years. Composed of input and output devices working at a prodigious speed, of memories with a virtually unlimited capacity and of infallible devices for computation, the computer has given a new direction to the processing of information. The consequences are many: concentration of the information in enormous mass memories, and in numerical and/or bibliographic data banks and data bases; unprecedented speed of operation, which makes all kinds of treatment possible; inversion of the information transfer process: it is no longer the user or the document that moves but the information, since memories can be interrogated at a distance from terminals connected to a central file. The development of new direct-access mass memories makes immediate consultation possible in real time, whenever the user wants.

At the same time, the cost of automatic processing and the inherent logic of the system, which both call for co-operation between organizations on an enormous scale, have led to standard methods and procedures enabling tasks and products to be shared. This has transformed the traditional centrifugal structures of distinct self-contained units into flexible transparent documentary networks with many access points. New alert systems make it possible to anticipate demand with confidence. The selective dissemination of information, i.e. regularly sending the user selected information in connection with his special interests, is one of the more interesting means of bringing supply closer to demand.

The use of computers does not leave room for errors or approximations, and they have made a powerful contribution to improving the analysis of information needs and user behaviour and done much to better man-machine relations.

The link-up between computer techniques and telecommunications (tele-processing) has become vital to the development of computerized systems and networks. It is operating in two directions: networks specialized in data transmission and using the telephone network or telecommunication satellites, and multipurpose

or specialized networks of interconnected computers with remote access to their files.

Other stages in the teleprocessing of information can now be discerned—the remote transmission of a copy of the signalled document, teletransmission, the utilization of video technology—all of which aim to bring the user as close as possible in time and space to the sources of knowledge.

‘The unanimous view is that during the decade 1980–90 automated information will entirely replace the more or less adequate manual processes at present transmitting and disseminating knowledge’.¹ This view should doubtless be qualified, but the trend is irreversible.

It is also possible to predict a spectacular development of micropublishing and microcopying at the expense of traditional paper-based carriers. In certain computer devices the use of paper has already been cut out altogether by the immediate transcription of the information sought on microfilm with instant processing (COM). The fact that the original document is enormously reduced when in microform avoids the piling up of paper and facilitates the distributions and dissemination of data.

Taken together, these advanced techniques tend to reduce the two main causes of substandard information, namely congestion and obsolescence.

These technical advances also require and stimulate great efforts to improve quality. The fact is that the effective use of such devices calls for the co-operation of specialists from all disciplines. Those concerned with the physical sciences and their applications in computer science, with operational research or with cybernetics are joined by those working in the many social sciences on essential but still little known and little studied aspects of information processing. Psychology and the behavioural sciences cast light on the human processes involved in knowledge transfer, such as the communication process, the learning process, the analysis of needs and man–machine interactions; semiology and linguistics deal with problems related to documentary languages and indexing as well as with automatic translation, automatic indexing and artificial intelligence; management science and economics help to perfect the design and management of systems (by means of systems analysis), to estimate costs, evaluate performance and draw up overall programmes; the education sciences work out programmes of education and training for the profession itself and for users; the legal sciences and sociology examine the legal and social aspects of information processing; decision theory and many other fields are also involved.

In this way a fundamental interdisciplinary body of knowledge is taking shape in the form of a new paradigmatic science, that is a distinct science recognizable from its theoretical foundations, broad agreement as to its purpose, and the methods and approaches it employs. It is a ‘crossroads of science’ seeking ‘a basic principle which would bring together the various strands of knowledge in a general framework in which each discipline would have its own place and in which its relationship

1. Anderla, *op. cit.*, p. 69.

with other disciplines would be clearly perceived'.¹ Information science, though still in its infancy and often reluctant to work out a formal theory embracing the applications of research and the results of its observations, is emerging as a remarkably fertile theoretical and practical field of knowledge.

The variety and complexity of the series of operations involved in information processing warrants this high-level interdisciplinary approach. Documentation does not simply consist in storing a certain number of documents in a logical order. It involves memory, selecting ideas, grouping together concepts and producing syntheses of data; one has to sort, evaluate, analyse, translate and retrieve material capable of meeting specific constantly changing needs which vary with the field of knowledge in question, the present state of knowledge, the type of user and the objectives being pursued. But they all share an overriding requirement, namely, that the information received be reliable, that is, trustworthy, up to date and immediately available.

This implies a great deal of work which has to be broken down into a set of operations known as the 'documentary chain'. These operations are so linked together that each depends on the one which precedes it, as the logic of the system requires. At one end of the chain we find the documents to be processed and at the other the products of this treatment, ranging from the simplest to the most elaborate: references and description of documents, retrieval tools, secondary and tertiary publications. The accompanying diagram illustrates the linear succession of documentary tasks.

Collecting information, the first link in the chain, is the operation whereby the basic collection, or set, of documents used by an information unit, is begun and built up. It breaks down into several stages: the tracing of documents, sorting and selection, acquisition procedures (purchase or otherwise). It assumes that the person in charge keeps himself regularly informed of the changing state of knowledge and of current work in the subject field concerned, and this means that the unit must be effectively integrated into the national and international, formal and informal scientific circuits. For published documents, a number of sources that are relatively accessible and easy to identify are used, such as legal deposit and the national bibliographies based on it, publishers' catalogues, directories and all kinds of indexes and bibliographies. But the search for sources of information is quite a different matter where non-conventional literature is concerned. Here, it is not enough for the documentalist to know of the existence of organizations or scientists who produce them; he must organize a systematic exchange and acquisition network, and to do this he must be tuned to the relevant scientific circles.

Documents, moreover, are not acquired at random but in accordance with a policy which is closely linked to the interests and objectives of the information unit. The sequence of choices leading to decisions about orders presupposes the best possible estimate of present and future demand.

Acquisition is followed up by control and registration procedures, and it is

1. F. Russo, 'La pluridisciplinarité', *Études*, Vol. 38, No. 5, May 1973, p. 77.

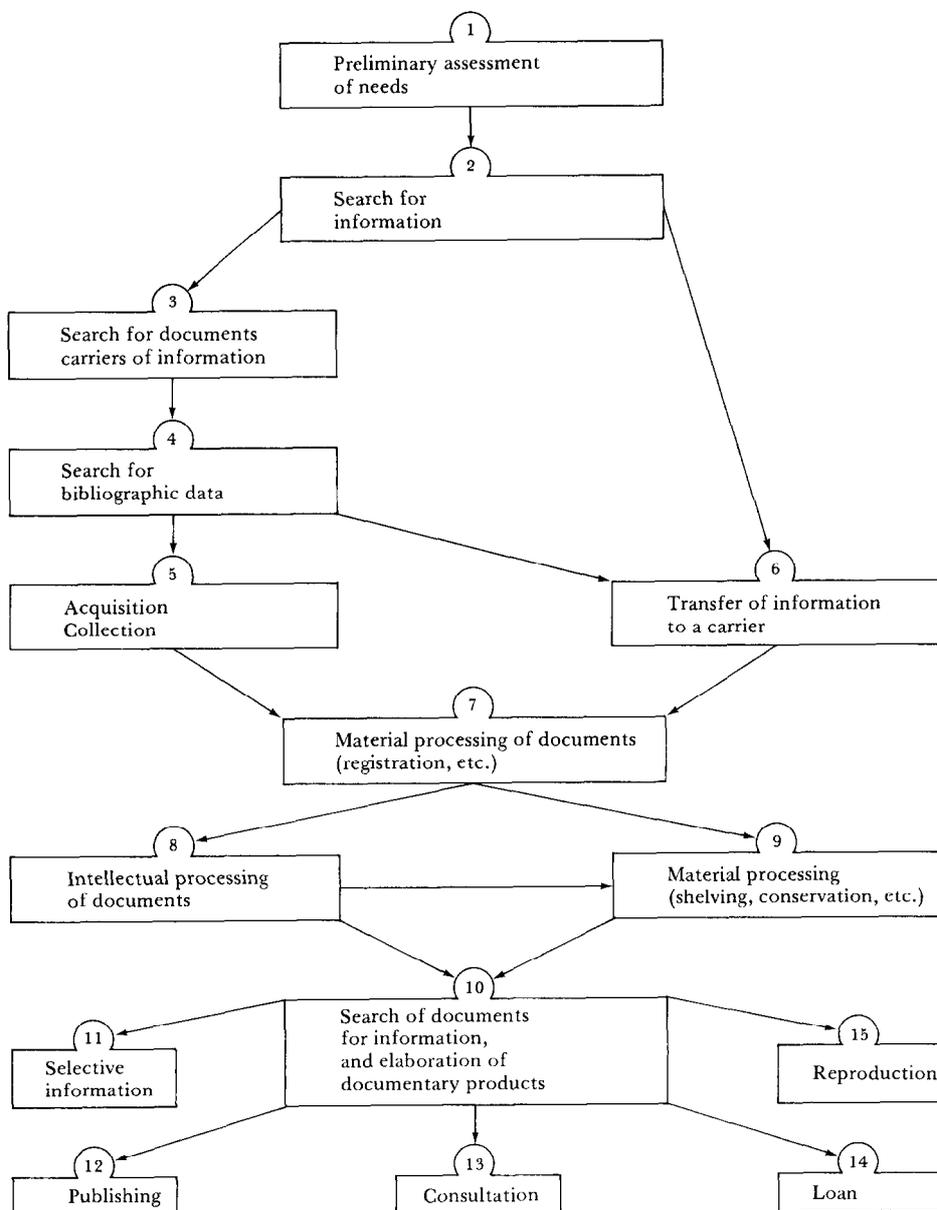


FIG. 2. The documentary chain. (After: ADBS, *Manual du bibliothécaire documentaliste travaillant dans les pays en développement*, Paris, Presses Universitaires de France, 1977, p. 9.)

only once the document has been verified and entered (temporarily or definitively) into the collection that the 'intellectual processing' stages begin: bibliographic description, contents description, storage (or memorization), retrieval and dissemination. The purpose of all these operations is to ensure that the information needed to satisfy a query can be retrieved immediately.

The first step required is to make out an 'identity card' for the document. This is the function of bibliographic description, or cataloguing, which identifies the formal characteristics of the document—author, title, source, size, language, date of publication, etc.—and notes them down in a bibliographic record, which is thus a true means of identification.

The next step is contents description, sometimes called 'documentary analysis', which covers several distinct operations such as description of the information contained in the document and its reformulation in terms acceptable to the system. What would happen if natural, free or common language were used to describe the contents of a document? There would soon be misunderstanding and total confusion owing to the richness and ambiguity of natural language, in which the words are far from having the same meaning for everybody. How, then, does one answer a query posed in a 'language' different from that of the answer? To alleviate semantic difficulties of this kind, the terms of the query and the terms of the document containing the answer are translated into a common unambiguous language, documentary language, in which terms have the same meaning for all who use them. Like natural language, it is composed of a vocabulary or set of terms called, according to the system or period, headings, keywords, descriptors, notations or indexes and a grammar, or set of relationships between words, which may range from a straightforward classification scheme to a complex pattern of relations. Compared with ordinary language, this vocabulary and grammar have two particular features which make them suitable for documentary processing: one is the fact that the vocabulary is purged of everything that might obscure the meaning, ambiguity of form or meaning, synonymy, poor informativeness, redundancy and so forth, and the other is that it is fixed, i.e. the use of terms and the relations between them are codified and cannot be altered at the whim of the user. The result is a fairly stable instrument, which can however be modified.

The amount of detail in the contents description will depend on circumstances. The most elementary operation is simply classifying: one identifies the main theme, with sometimes a few subsidiary themes, and expresses it by means of the appropriate term from the documentary language. Such classification is often the only type of contents description carried out in non-specialized libraries using encyclopaedic classifications (that is, ones that embrace all fields of knowledge) or very general ones. The aim is to classify the information in a limited number of subject categories and to arrange the files so that the document containing this information can be found more quickly.

Indexing represents a further level of description since it involves determining the concepts dealt with in a document in relation to their importance for the documentary system in question and expressing them in the documentary language

by means of appropriate terms or numbers. This is a vital operation which assumes knowledge of the document's subject field and a precise definition of the level of information that should be conserved in order to meet user needs.

Lastly, compression serves to produce an abstract of the original document which will vary in length and type according to the level of analysis, value of the document and the system in use. Abstracts have two advantages: they facilitate storage in the memory by cutting down the time and cost of retrieval and they reduce the consultation time by enabling the user to obtain a rapid picture of the information contained in a text.

Once these operations have been carried out, the document and the information it contains are represented by a record which can be entered into the memory, that is, integrated into the system's storage and retrieval devices, which may be the traditional file (or catalogue), a semi-mechanized file (on punched cards) or a machine readable carrier (magnetic tape or disc, punched card or tape). As for the document itself, it is shelved, i.e. placed in a specific location in accordance with the system employed by the unit: by type of document, size, author (alphabetical filing), subject-matter (systematic filing), accession order (chronological filing) or some other principle. Filing is a routine operation which simply indicates where the object is to be found when needed. A marking system noted on the document (call number) specifies this location once and for all.

Documents, or at least textual documents, can be stored in their original state or in a reduced form or microform. This method of recording documents on microfiches or microfilms is becoming increasingly common since it saves space (in some cases the volume of the text is reduced by 95 per cent) and weight, makes it possible to duplicate collections by instant reproduction, and facilitates distribution. Its advantages far outweigh certain drawbacks with respect to reading and conservation which are undeniable but capable of improvement.

Information retrieval is carried out from the memory and not from the stock of documents. This operation, together with its corollary the dissemination of information, constitutes the real basis of the services provided for users and the *raison d'être* of the information unit. Whether manual (from card catalogues) or by machine (from computer memories), retrieval can take different forms: retrospective search through the collection as a whole to find all the documents relevant to a query, current search focused on the most recent documents, selective retrieval, mixed retrieval, etc. As for the documentary products, these too can be very varied: the document itself, citations from it (by means of secondary documents such as bibliographies, which list them), or the provision of information that has been extracted and elaborated in documents of evaluation and synthesis ('tertiary' documents). Regular or occasional dissemination tailored to the expressed needs of a user, service provided on the spot or at the user's base, etc., all require different approaches, call for particular instruments and are designed for a different type of public.

Virtually all these operations can be carried out automatically with and by computers. Everything to do with the entry and selection of bibliographic data

on a machine readable input sheet or by direct machine reading of the text ('optical reading'), control and verification, automatic indexing by means of a special language contained in the machine (the 'thesaurus'), the storage of data in the files and its retrieval according to various criteria and methods, the preparation of documentary products (especially 'indexes') and answers to questions, can be performed automatically with extreme rapidity, doing away with duplicated efforts and repetitive manual operations. Soon, attempts at automatic condensation and translation may join the list of documentary tasks carried out by machine. Computers are also used for acquisition procedures, orders and accounting.

Depending on their particular function, information units specialize in a particular link of the documentary chain, such as storage and on-site consultation (e.g. traditional libraries with the role of safeguarding the national heritage), contents description and dissemination (documentation centres and services) or exploitation of the information contained in the documents (information analysis centres like data banks, analysis and liaison centres).

If documentary tasks are rationally organized there is in fact no need for them all to be performed by the same unit. On the contrary, the present trend is for a growing diversity of organizations specialized in information handling that reflects the explosion in supply and demand. The user for whom time was not a vital consideration and who went to the library himself to search through the manual catalogues has now been joined and often replaced by the man in a hurry demanding up-to-date reliable information provided with minimal delay on his desk.

The increasing number and variety of users is being matched by the widening range of services and products available. The proliferation of terms distinguishing the various kinds of information unit—libraries, archives, special libraries, documentation centres or services, analysis centres or services, data banks, data bases, multi-media centres, referral services, data centres and so forth—reflects the extensive possibilities of documentary information.

As a matter of fact, these various types of unit differ from each other by the particular portion of the documentary chain in which they specialize. Three main branches of activity exist side by side: the conservation and provision of primary documents (the documents themselves), contents description and dissemination with provision of references and indication of sources (secondary documents), and the supply of information based on available data (tertiary documents). In practice, this distinction reflects quite different services and increasingly refined products for different types of user. The student preparing a thesis in chemistry, for example, will turn to a specialized documentation centre to find out what has already been done on the topic that interests him and will then have to consult the indicated documents for himself, while an engineer wanting to know the latest results of an analysis will get them from a data analysis service in the form of specific immediately usable information.

Whereas conservation libraries have been in existence since antiquity (think how the memory of the fabulous library of Alexandria, whose catalogue shows that it contained over 700,000 papyrus scrolls in 48 B.C., has come down through his-

tory), documentation centres are the response to more recent needs for the description of a literature that has become too abundant and too fleeting to come to the direct knowledge of the user. This is why centres of this type set up within a great variety of organizations such as companies, universities, public administration and government, tend to concentrate on highly specialized and sometimes very small groups of users. Their number — there are over 100,000 of them in the world — shows how far the system of alerting and searching they constitute has become indispensable.

The third type of unit is a very recent development. Its job is to reply rapidly and reliably to highly specialized queries by providing information that has been selected, verified, evaluated and then reprocessed in the form of products of recognized validity, such as state-of-the-art reports, syntheses, trend reports and so on.

These units include referral services. Clearing houses and liaison services with the particular responsibility of directing users towards information sources in the field or activity with which they are concerned.

In practice, though information units concentrate on a particular function they do not entirely exclude others. Many documentation services, for example, will possess a library and many libraries will be able to provide secondary documents.

Thus, conservation, documentation and information represent the focal points of a complex family of organizations with different titles but complementary functions. In this way, an information network forming vast integrated systems on a national and international scale has to come into being. The idea of 'network', that is, co-operative and task-sharing systems, is not new but it has derived a great deal of support from the new techniques of information processing, computing and telecommunication. The units can be interconnected at different levels, geographic, functional and sectoral, and can exist side by side or overlap, thus constituting an enormous web of integrated exchanges. Some documentary functions include specialized networks: acquisition networks, shared cataloguing, shared storage (particularly in microfilm), data compilation and storage, all of which can be arranged on a co-operative basis with procedures accepted by the members of the system. Discipline- or mission-oriented specialized networks include units specialized in a particular sector such as medicine or the earth sciences, or in an economic and/or industrial activity. We also find networks centred on an special need-group such as a small- and medium-sized enterprises or public administration.

Today, several dozens of large information systems with varying degrees of centralization co-ordinate world information in their field: for nuclear information, for example, INIS has some sixty national and international centres to cover almost all the literature on the subject; in the field of medicine, MEDLARS operates in eighty-five countries while EURONET is being set up to deal with scientific and technical information in the countries of the European Community.

The size of these systems, and the extent of the political, legal, financial, human and economic obstacles they have to overcome, often make government support necessary and call for co-ordinated political resolve.

Co-operative information-processing naturally leads to the increasingly rational organization of national institutions with a view to creating an integrated system.

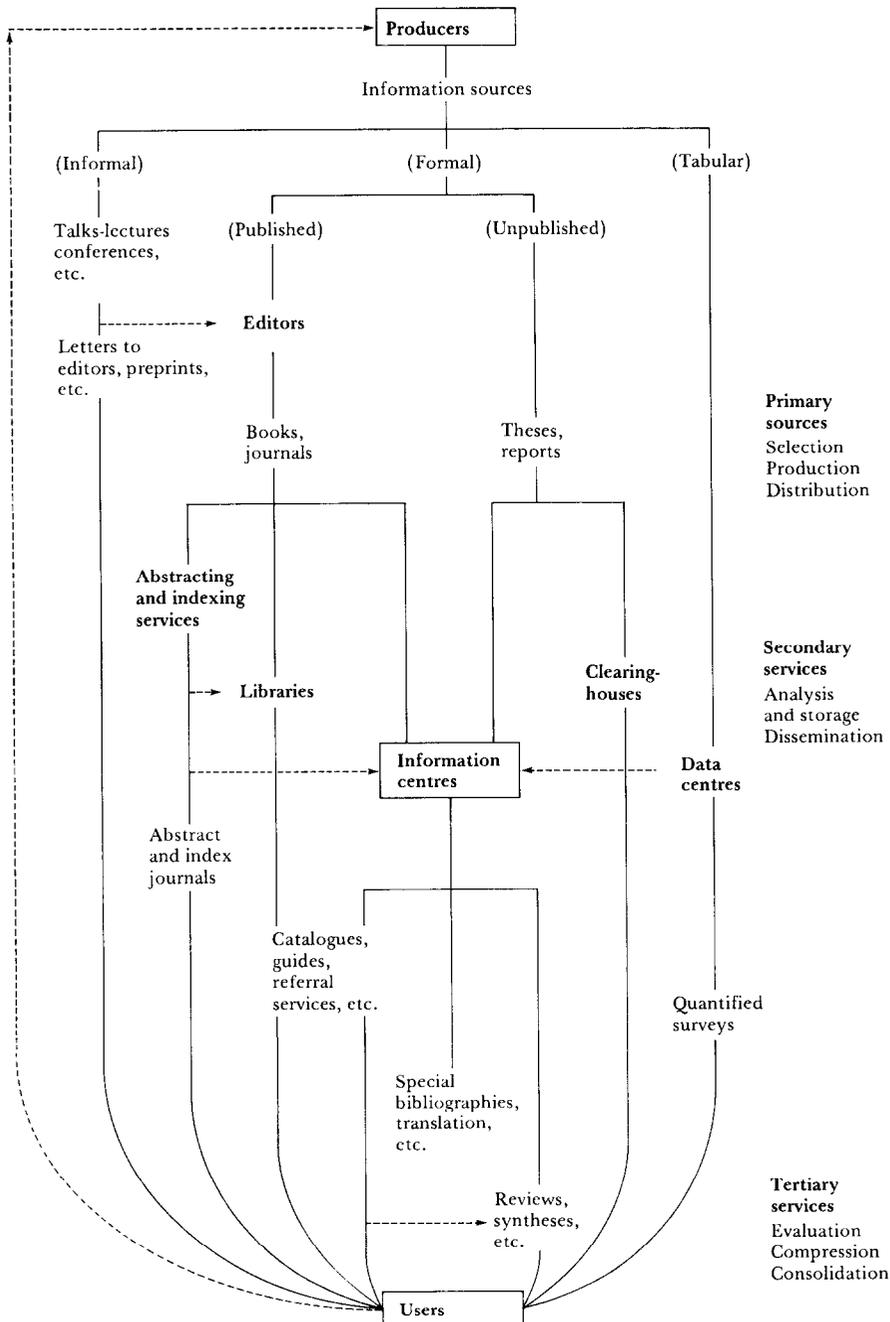


FIG. 3. Some channels for disseminating information. (From *Handbook for Information Systems and Services*, Paris, Unesco, 1977, p. 8.)

All efforts in this direction assume that the development of information processing will be taken into consideration within the national overall planning process. The design and establishment of a national information system, usually under the responsibility of a public body, goes through two vital stages: definition of the overall architecture of the system in relation to national conditions and strengthening of the information infrastructure.

New tasks bring new requirements. As we have seen, the control of information can no longer make do with professional expertise focused on the knowledge and techniques of books (librarianship) or documents (documentation) but must have recourse to a wide range of disciplines. This has opened up a great new area of research which in actual practice is not so removed from the day-to-day needs of the professions as might appear since research workers in the information sciences rely on methods and observations which require the participation of information units. The latter, in direct contact with both technical operations and users, provide study material and data as well as opportunities to carry out experiments essential to the formulation and testing of theories. The impact of research on information processing can be discerned in the rapid progress of procedures and techniques, so that every information specialist at every level sees his work nourished and moulded by the constant support of basic analysis.

Changes in demand and the need to move on from the provision of documents or references to that of the information itself has transformed the nature of the profession. The work of information specialists has become more varied, specialized and refined. The boundaries separating them from scientists have shifted and there is now more and more mutual understanding. New skills are needed, in linguistics, data processing and logic, not to mention the subject field, for one can analyse only what one understands. This necessary interaction is summed up in two facts; for one thing, the development, through appropriate training, of basic skills and techniques in documentation on the part of users is one of the most important objectives of those responsible for information. Secondly, information specialists are tending to require a dual qualification, in documentary techniques and in the field or subject with which they deal, and continuous vocational training to update their knowledge.

Backed up by specialized support personnel and by all those engaged in training and research, the profession is composed of a great variety of profiles, some of them not yet clearly defined: analysts, indexers, cataloguers, computerization specialists, information officers, system designers, generalists, technicians, liaison officers, consultants on information systems. These people supplement and enrich the traditional professions of librarian and archivist and all share the same concern, to provide an efficient access to information, and hence to knowledge, for the largest possible number of users, and to safeguard their profession from being degraded by the retention of information, and by ignorance, bias, subordination, ideological secrecy and censorship.

These specializations in information are served by differentiated education and training programmes—though still too few, especially in the less industrialized

countries—whose development and co-ordination are now of major concern for the profession. It is here that international co-operation, either through large international organizations such as the United Nations and its Specialized Agencies or through bilateral and multilateral agreements and conventions, is making its appearance in various ways. In particular, an important effort is being made to assist developing countries in preparing and setting up training programmes either locally or in a technically advanced country, to send them skilled personnel and provide financial assistance, not to mention documents and equipment. Any person wishing to obtain training in these techniques should be able to benefit from the opportunities offered by an increasingly dense international training network.

The fact is that, beyond their technical differences, all the information professions share certain characteristics that account for their attraction. The information specialist is a person concerned with communication and contact whose curiosity and critical mind are continually being called upon to serve the community, whose training can benefit from regular readjustment and whose intellect is stimulated by the enormity of the needs and tasks ahead; he is engaged, moreover, in a new profession in the forefront of today's concerns with the vital role of linking science and moral awareness. It is largely his task to meet the challenge of the documentary explosion.

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1 The types of documents

A document is an object that provides information. It is the material carrier of knowledge and the memory of mankind. It is no doubt possible and even necessary to obtain information from other sources, for example by asking an individual or organization, by attending a meeting or conference, by visiting an exhibition or by listening to a radio or television broadcast. But these sources have themselves for the most part gathered their information from documents.

There exists a great variety of documents and the information specialist must be perfectly familiar with their distinctive features and be capable of identifying the category to which any document belongs so that he can process and utilize it properly.

Characteristic features

The characteristic features of documents are of two broad types: the first is physical: materials used, nature of the signs employed, size, weight, layout, means of production, possibility of direct consultation or necessity of using a mechanical device, periodicity, etc.; the second type is intellectual: purpose, contents, subject, type of authorship, source, method of dissemination, accessibility, originality, etc.

The physical characteristics of a document all have some influence on the way it is processed. Weight, size, mobility, solidity, age, state of preservation, uniqueness, rarity or multiplicity are all factors that determine the selection and exploitation of a document.

The nature of documents leads us to begin with a fundamental distinction between textual and non-textual documents. Both these categories contain a wide variety of documents.

Textual documents present their information exclusively or essentially in the form of a written text to be read. They include, for example, books, periodicals, statistical compendia, cards, administrative documents, legal documents, catalogues, trade publications, patents, etc.

Non-textual documents may contain some text but the most important part of

the information is presented in some other form. They are meant to be seen, heard or manipulated, and are divided into:

Iconic documents: images, maps, plans, graphs, diagrams, posters, paintings, photographs, slides.

Sound documents: sound records, sound tapes.

Audio-visual documents, combining images and sound: films, slide shows, video tapes and discs.

Documents of a material nature: objects, samples, mock-ups, artistic works and monuments, books in Braille, teaching games.

Mixed documents which bring together various textual and non-textual documents on the same subject, such as books and records, educational kits.

Magnetic documents for computer processing, i.e. the programmes that make it possible to carry out the various operations of calculation, sorting, simulation, file processing, etc., and the files.

The material is the physical body of the document. Nature is not the same as material: a document of an iconic nature, such as a photograph, can exist on two different carriers, negative films and paper print. Traditional materials such as stone, clay, wood and textiles were, in the course of history, gradually replaced by paper, which is still the most common carrier. Technological innovation, however, has introduced new materials which are being used on an increasing scale: plastics (discs), magnetic materials (sound tapes, computer tapes and discs, video tapes and discs), light-sensitive chemical materials (films, photographs, microforms). Each material has certain physical and chemical properties which affect the conditions under which documents are conserved and used and which require special treatment.

Mode of production

This serves to distinguish raw documents from manufactured documents. The former are objects in their natural state, such as soil samples, minerals, plants, bones, fossils and meteorites, while the latter are man-made objects, ranging from the products of craftsmen or industry (archaeological remains, specimens, prototypes) to intellectual creations (works of art, literary, artistic, scientific, or technical productions, utilitarian documents, etc.) made by hand or by machine.

The main production techniques are engraving, lithography, printing, duplication, and photographic, electrical or photo-electrical processes. They may be used on a small scale or for mass production.

Technical innovation and the use of new materials are having a considerable impact on the way manufactured documents are produced and hence used. Techniques have become more varied and more simple—and in consequence more widespread—but also more powerful, with an increased capacity for production.

Reprographic techniques make it easy to reproduce documents and thus extend

the possibilities of access and dissemination, which were hitherto reserved for a minority. In spite of certain drawbacks, micro-publishing, or the issue of a document in a greatly reduced format on film, fiche or card, has the considerable advantage of saving weight and space and making distribution and copying more convenient, qualities which facilitate the work of information units and enhance the flow of information. Textual or iconic documents may exist in both normal and micro form so that the one which is most suitable for acquisition, conservation and utilization can be chosen. The use of computers for the processing of texts, images and numerical data considerably simplifies and speeds up work since documents may be automatically produced and transmitted to remote places.

Utilization

Utilization provides another essential criterion for distinguishing between documents and making a selection. Some may be used directly while others require special equipment. Microforms, for instance, cannot be read by the human eye and call for reading devices to enlarge the images; audio-visual documents can only be used with equipment to project the image and/or reproduce the sound, and a computer's magnetic memory is only accessible by means of electronic data-processing equipment. When it is planned to utilize documents of this type it is essential to have enough devices available and to be able to keep them in good order. It should be noted that their cost is falling rapidly and that they are becoming increasingly common and easy to use.

Periodicity is an important characteristic, especially for textual documents. Some documents are only produced once while others are published in series. Serial publication is the appearance of successive volumes or issues at reasonably regular intervals, and include series of books, periodic reports, journals and newspapers. Each issue, of course, has a different content but the physical layout, title and many other characteristic features remain unchanged.

Journals and newspapers are known more specifically as periodicals since they come out at set regular intervals, though their periodicity may vary from twenty-four hours for a daily newspaper to one year for a yearbook or annual report. It is important to know the periodicity of journals in order to be able to check that they have arrived.

Series represent another way of grouping documents, but in this case, regular periodicity is not necessary. The documents simply have the same form, generally the same purpose and a content that differs but deals with the same theme, which is made explicit by the particular title or designation of the series. In many cases, each document in the series is given a serial number. Besides textual documents, there exist series for sound documents, photographs, slides and certain other non-textual documents.

The method of publication provides the basis for another important dis-

inction between published and non-published documents. Published documents are commercially distributed and may be bought freely either from the organization that produced them, which often specializes in this activity, i.e. the publisher, or from bookshops. Non-published documents are not marketed and distribution is more or less restricted. They form what is called 'non-conventional literature', some being handwritten or typed while others are produced by duplication processes or even printed, the number of copies, however, is always limited. Many of them are working documents or reports of studies, which will eventually be supplemented or modified and are reserved for the personal use of their author or for the internal use of the producing organizations. They are very important in research, administration, production and service activities and are either never published or published only after a long delay. The value of these non-conventional documents depends as much on their content as on their being up to date, and in certain fields they constitute a precious if not unique source of information.

Access to these documents is difficult because production is scattered; they are not published and often not even listed. Some of them are secret, at least for a certain length of time (certain military, political, administrative or business documents) and can only be obtained by a limited number of authorized persons, while others are in fact only limited by the mode of production and the small number of copies (an unpublished thesis for instance). These documents have to be systematically hunted up, mainly through personal contact with the authors or producing organizations.

Many documents of a personal or family nature are protected by measures forbidding their communication before a given lapse of time (twenty-five or fifty years).

Day-to-day handwritten documents such as letters, memos, invoices, etc., are usually preserved for administrative reasons or as evidence. Like drafts, blueprints and notes, they may acquire a historical value that has nothing to do with their original purpose.

The intellectual characteristics of a document serve to define its value, interest, public, mode of processing and utilization.

The purpose of a document, or the reason why it was produced, varies greatly. It may serve for evidence or testimony, for keeping track of an event, preparing another document, presenting ideas or results, for a person's work or recreation, for teaching, illustration, advertising or popularization: in other words, for disseminating knowledge in a more simple form in order to defend the rights of an individual or community, etc.

The degree of elaboration allows us to make the vital distinction between primary, secondary and tertiary documents.

Primary documents are the original documents prepared by the author.

Secondary documents are documents which refer to primary documents and would not exist without them; they contain a description of the primary documents in the form of bibliographics, catalogues, bulletins or tables of contents, etc. (see Chapter 2).

Tertiary documents are based on primary and/or secondary documents. They gather together, condense and transform the original information, reworking it to meet the needs of a certain type of public, and take the form of syntheses, reviews, states-of-the-art and so forth (see Chapter 17).

The contents of a document can be approached from various points of view such as subject-matter, level of presentation (how systematic or exhaustive, for a general or specialized public), scientific level, level of originality or novelty, the age of the information (often depending on date of publication) and whether the document is partly or mostly composed of numerical data. All these criteria are relative: a document may contain no new information but be presented more clearly and more accessibly for a given public; the contents of an old document may be completely out of date yet stand as valuable evidence of its time. For each information activity, the most important criteria for evaluating a document have to be determined.

The origin, source and author of a document play an important part in the way it is used, since the source may be private or public, stated or anonymous, individual or collective, kept secret or revealed. The author may be an individual, several individuals or a corporate body (i.e. one or several organizations). This might have some bearing on the mode of acquisition as well as on the processing and possible dissemination of the document.

The degree of confidentiality of an information source affects the use that can be made of it. A journalist might, for example, refuse to divulge the source of his information, but this would not diminish its validity since this is an accepted practice in the profession. A scientist, on the other hand, has to produce evidence to back up his assertions and to state his sources.

Certain non-copyright documents may be used by anyone, whereas others are regarded as intellectual, artistic or business property or covered by certain common-law measures which forbid their use during a fixed period without the payment of dues; this may reduce the possibilities of dissemination considerably.

The types of documents identified by information units are not so numerous and varied as an exhaustive classification could suggest. The categories used reflect the practical concern to facilitate the operations of selection, shelving, processing, retrieval and dissemination.

There is usually a formal distinction between monographs (single documents dealing with a given subject), periodicals, patents, non-textual documents (including images, maps and photographs), secondary documents and non-conventional documents. In each case the categories are defined in relation to needs and any special processing that is envisaged.

From the intellectual point of view, the usual distinction is between essential or core documents mainly or exclusively concerned with subjects of particular interest to the unit, and peripheral documents, which fall into two sub-groups: those with quite a lot or a fair proportion of relevant information and those, usually rejected, with only few references of interest and very little relevant information.

The former are obtained and processed more quickly and more thoroughly than the latter. Here again the distinction is entirely functional and depends on needs and objectives.

Structure of documents

This varies with the type and, to a certain extent, with the document, but certain common denominators may be discerned. In some cases, the document is self-sufficient and contains all the indications needed for processing. In others, it has to be accompanied by a second document (descriptive sheet, note, notice, filming or recording report, etc.) which identifies its nature.

In general, a **monograph** comprises a cover, a title page, a table of contents, and a text divided into several sections or subsections. In addition, there may be illustrations accompanying the text, footnotes or notes at the end of each chapter or at the end of the volume to supplement the information given in the text (citations, remarks, notes, etc.), a preface usually written by someone other than the author, an introduction and a foreword by the author or someone else placed before the main text or a post-face at the end, either of which may serve to present the author, the work itself, the subject treated, the author's intentions or a summary. There may also be one or more bibliographies placed at the end of the volume or chapters, a glossary, an index of the subjects, persons and places mentioned and annexes or appendices containing further data.

A **periodical** is made up of a cover, which remains the same for each issue but can undergo modifications in the course of the periodical's life, and a text containing the following elements:

A table of contents with the lists of articles and headings.

Several articles, with or without abstracts, bibliographies or illustrations.

Possibly a section for news concerning the life of the publishing organization or recent events in the discipline or field.

Possibly a bibliographic section, announcements and reviews of recent publications, reviews of varying length.

Letters to the editor.

Advertisements.

In addition to these, there may be an editorial, a kind of address to the reader signed by the editors or editorial board of the periodical, which expresses their direct opinion on a subject of current interest or on the articles. Certain periodicals carry abstracts of articles in several languages or even the full translation of articles into one or two languages, while others contain articles in several languages, both types being forms of bilingual or multilingual publication.

Each year, the table of contents of the year's issues are collected together in a table of articles or index, with references to the corresponding issue and page; this table or index may be cumulative, covering a period of five or ten years, and

provides a rapid and reliable tool which avoids the need to leaf through an entire collection to find an article or author.

Periodicals are numbered, either as a continuous series or by year or volume and issue.

Non-published documents. Especially when not intended for conservation as such, may be presented in a much more variable manner. In particular, the very important details concerning author, title, date and source to be found on the title pages, contents pages and covers of published documents are sometimes omitted.

The form of **non-textual documents** can vary greatly, depending on their nature, purpose and content, from the simple (e.g. a photograph of a single object) to the complex (e.g. a sound film showing how to train an animal).

Identification often presents a problem. The author, title, source, parts and other details may be noted on the document itself as a legend or label or at the beginning of a recording, or they may be marked on the packing (sometimes both, with information on the packing supplementing the document's notice, or vice versa), or again they may be given on an attached document (e.g. in the case of raw documents, certain material documents, negative films or photographs) which indicates their nature, date and place of collecting, production or filming, etc. Maps, technical drawings and graphs include, in addition to the actual design, details such as the title and possibly the author, date, source, printer or publisher, a legend or explanatory list of the conventional signs and colours used, and especially a scale or statement of the ratio between the actual dimensions and those on the paper.

Some documents, such as laws, the decision of courts of justice, periodical reports, research proposals and so forth are often composed of the same subsections, sometimes presented in a fixed order.

Each part of a document has its own particular value and usefulness for the various operations of identification and processing. In general, there are first of all the most obviously informative parts such as the cover, title page, contents page or table of contents. Most of the data required should normally be located in specific places fixed by standard practice or custom: date of publication, for example, is mentioned at the beginning or end of a document.

Normally, the title and denomination should be enough to characterize the document, but they often turn out to be ambiguous, vague or incomplete and have to be supplemented by other indications. In the case of a textual document, the cover, title page, table of contents, the titles of chapters, sections or paragraphs can be used to obtain a general picture and identify the various parts of the text. The index, too, is a useful guide to the topics covered, and abstracts, introductions, prefaces, forewords, etc., can provide an overall impression of the document, its point of view and intentions. The general layout, bibliography and illustrations suggest the type of presentation chosen for the topic in question.

Where non-textual documents are concerned, the first step is to note the information on the packing or labels or at the beginning of recordings. This information, however, will probably need supplementing by an examination of

attached documents or of trade catalogues and documents, which sometimes contain a very detailed presentation.

One should also look at the document itself as a whole. Although this is often the only way of identifying non-textual documents, it is in fact necessary for all documents, if only for purposes of verification or more detailed processing.

The documentary unit is that part of a document which has been arbitrarily picked out for further processing, whether bibliographic description, contents description, information storage and retrieval, or dissemination. This is because a document, being a physical entity, may contain information of various kinds or on different subjects which would gain from separate processing. These units sometimes—but not always—correspond to parts of the document that can be separated physically, a chapter in a book or an article in a periodical, for example, or a table, appendix, map, etc. The only limitation is that the selected unit must be physically reutilizable. Any documentation system should work out its own rules for identifying documentary units in terms of the particular nature of the contents, the desired level of analysis, user needs and practical possibilities. The documentary units are then processed as documents with, of course, a reference to the original document from which they come, which is processed separately.

Certain conditions must be satisfied before a given object or product can be treated as a document and make a real contribution to communication and the transfer of knowledge.

It must be genuine, with an origin (author, source, date, as the case may be) which can be verified whenever the state of knowledge allows. It must be reliable, i.e. worthy of confidence, and one should be able to gauge the accuracy of the information it contains by means of the arguments or evidence provided or by checking it against reality (for example by repeating an experiment or calculation).

It should be as accessible as possible, in the physical sense (i.e. with a known location and capable of being communicated through loan, acquisition or reproduction) and in the moral sense (i.e. capable of dissemination to certain users at least). How up to date it has to be will vary with the user and how it is used: a subject of current interest is processed with the most recent data and care must be taken to update the information as more facts come to light and reach the information unit, while historical research has need of contemporary documents as well as recent information on the subject in question.

The usefulness of a document depends on the relation between its subject and mode of processing on the one hand and on the information unit's specialized field and user needs on the other: the closer the relation, the more useful and relevant the document will be for the system.

The life of a document

The life of a document or documentary unit depends on its intrinsic value, the discipline or subject field (facts change and knowledge evolves at different speeds:

a philosophical work may remain valid for centuries whereas the specifications of a machine will be relevant only for the few years during which the machine is not extensively modified), its currency and its relevance to the present state of knowledge, the objectives of the information unit or user needs.

Using statistical methods, it is possible to calculate how frequently a particular document or type of document is employed or referred to, and to determine its life cycle. The cycle generally begins with a quiet period, while the document is new and not well known, followed by one of more or less heavy use and then one in which it is gradually used less and less often until the time comes when the document has no more than historical value.

The life of some documents is strictly limited since they lose all value with each new edition. This happens with yearbooks, standards, directories, loose-leaf publications, and with news reviews whose life ends with the day's events.

Preliminary or preparatory documents for congresses or courses, interim reports and survey data are usually reworked to a variable extent for subsequent publication, at which time they can be disposed of.

As a rule, books have a longer life than articles in periodicals, which last from about five to ten years depending on level and subject field; updating ceases as new comprehensive texts appear.

As a matter of fact the utility of any document produced at a given time to meet a particular type of need will gradually decline until the need for it disappears altogether. This is not so for raw documents, evidence of a state of fact (fossils for example) and for documents that have acquired a historical value independent of the current scientific or technical situation. Frequency of use should not be confused with utility, since a little-used and possibly very old document can be of considerable interest for certain purposes or certain people.

Check questionnaire

What is a document for?

What conditions does an object have to satisfy to be regarded as a document?

What is a secondary document?

What is a documentary unit?

What is a periodical?

What is a non-textual document?

What is a microform?

What determines the life of a document?

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Audio-visual documentation

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SCHWARZ, D. *Conservation des images fixes*. Paris, Documentation Française, 1977.

(See also the bibliography of Chapter 11.)

Appendix 1. Definitions of the main types of document¹

- Abstract* : a written or oral text reduced to its essential points (Afnor).
- Abstract bulletin* (or journal) : any periodical made up of a series of titles accompanied by abstracts and usually arranged by subject.
- Annals* : (a) a work relating events in a chronological order, year by year; (b) title used by journals or by regular collections of facts.
- Archives* : a collection of documents, regardless of their date, form or physical medium, elaborated or received by a person, public or private body, by virtue of their activity, organized and permanently conserved in pursuance of that activity (Afnor).
- Atlas* : a set of geographical maps, tables, plates, etc.
- Book* : a set of printed pages brought together to form a paper back or bound volume.
- Cassette* : a plastic container for audio and video tape, or film.
- Code* : the name given to certain documentary lexicons in which concepts are designated by a special system of symbols.
- Collection* : a set of bibliographic units of theoretically unlimited duration grouped under a common title (Afnor).
- Collection of papers* : a work composed of articles written by several different authors on various subjects and produced in homage to someone by his colleagues.
- Communication* : an oral or written address to a learned society.
- Document* : an aggregate of an information carrier, the data recorded thereon or therein and their meaning, used for consultation, study, testimony (Afnor).
- Documentary language* : a set of terms used to designate concepts in the description of documents belonging to a particular field.
- Extract* : a passage from the actual text of a document.
- Film* : a sensitive surface of flexible transparent material in the form of sheets, strips or rolls (Afnor).
- Filming notice* : a descriptive notice containing information to accompany a film and used to facilitate editing and commentary.
- Functional diagram* : a document using conventional graphic symbols of mathematical expressions to represent various parts of machines and their circuits and to show how they function.
- Graph* : a representation by means of a drawing or similar procedure of all kinds of given or observed data.

1. This list does not include documents, such as bibliographies, textbooks, etc. dealt with elsewhere.

Illustration : an engraving or drawing accompanying the text of a book, journal or article.

Image : a display of information by projection, generally for visual use (Afnor).

Issue : (a) an instalment or part of a work or a periodical published in sections; (b) exceptionally, a complete work forming part of a series.

Kinescope : a silver film obtained by the transfer of a video programme.

Loose-leaf publication : a publication whose binding makes it possible to include or substitute updated or additional pages (Afnor).

Magnetic tape : an extremely flexible plastic film overlaid with a metallic oxide on which sound is recorded by means of a tape-recorder. These tapes are wound on to different types of reel, in rools, or in various sizes of cassette.

Model : a reduced-scale copy of a device, machine, setting or work of art.

Monograph : a self-contained work, in one or several volumes, published either as a single unit or over a limited predetermined period of time.

Newsletter : the name given to certain periodicals that inform the members of an association or administration about its activities.

Newspaper : a periodical issued at very frequent intervals.

Nomenclature : (a) a systematically classified list of terms employed in a science, technology, art, etc. : (b) a systematic list of the items in a collection.

Official publication : any text published in the form of a volume, booklet or even periodical by a government, nationalized company or international body.

Omnibus volume : a compilation of several works published together.

Periodical : a publication, normally by several authors, recognized by law in certain countries, appearing usually at regular intervals fixed in advance, whose successive instalment, generally including a contents page, are chronologically and serially linked for a period of time initially unlimited (Afnor).

Plate : an extra-textual illustration, i.e. not included in the paging of a printed work.

Preprint : a paper issued before final publication of the full text and distributed in a limited number of copies.

Print : an image printed after having been engraved on wood, metal, stone, by lithography, etc.

Printed work : a scientific, technical or literary text which forms a bibliographic unit.

Proceedings : preprints or summaries of scientific communications presented during a congress.

Prototype : the first version or exemplar of a device, machine or other production.

Punched card|tape : a card or paper tape on which figures or letters are recorded by means of punched holes.

Report : (a) a document setting out the results of a study or piece of research; (b) a document reviewing the activities of an organization during a given period of time (progress report).

Reprint : a copy of an article as published in a periodical or omnibus volume.

Review : (a) an account, address or report on an event; (b) a critical analysis of a work.

Series : a publication intended to be continued indefinitely, generally issued by one or several bodies and not necessarily appearing at fixed intervals.

Sound montage : the grouping of previously separate recordings for the purpose of uninterrupted presentation.

Sound record : a flat plastic disc used for recording and reproducing sounds.

State of the art (or synthesis) : a report on the present state of a subject or field, drawn up by evaluating the relevant literature over a given period of time.

Synopsis : a short summary of a work, usually by the author.

Thematic map : a document resulting from a specific study requiring interpretation, analysis or synthesis on a given theme.

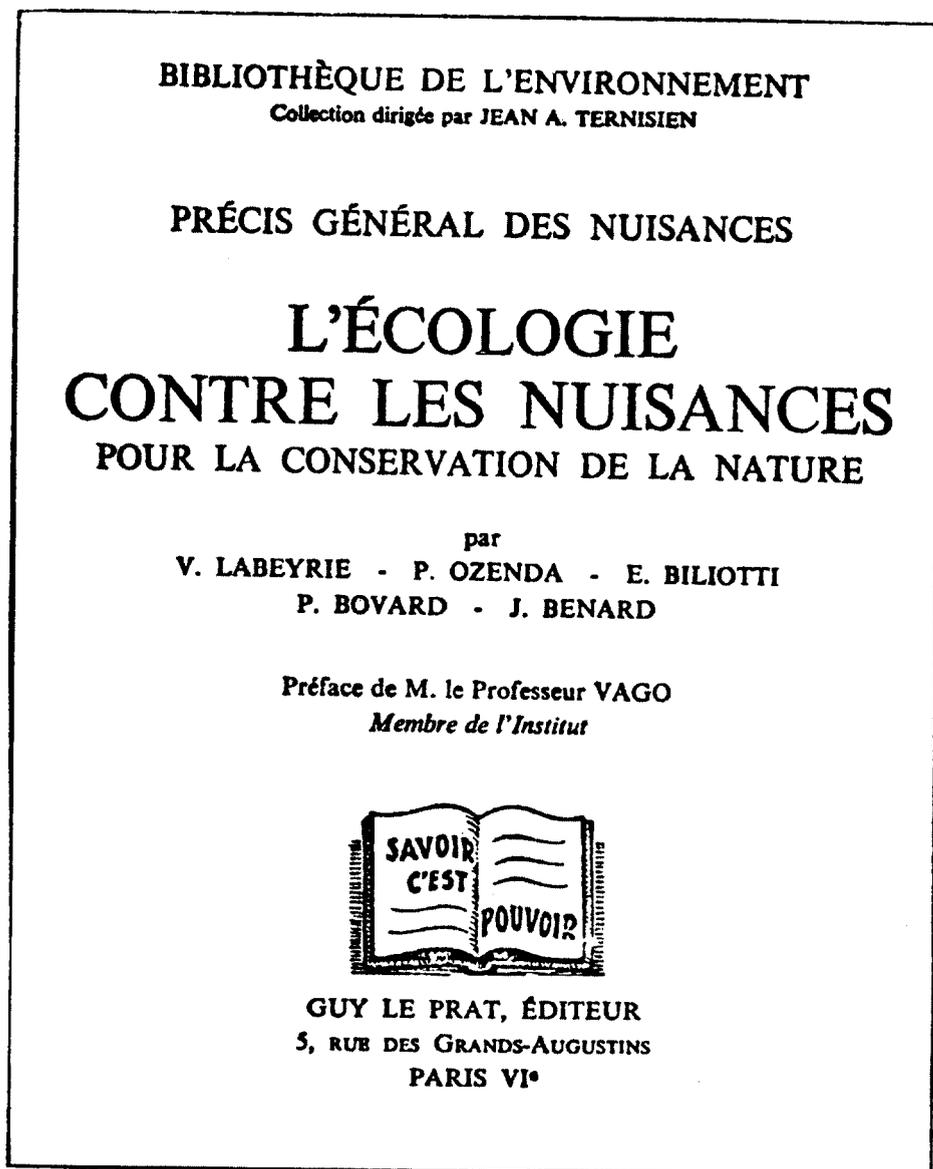
Thesis : research submitted to a faculty to qualify for a university degree.

Trade mark : a sign or symbol used to distinguish the products or services of a company.

Video cassette : container for video tape whereby recorded images can be viewed on a television screen by means of a video tape-recorder.

Video tape : a special magnetic tape used for recording images and sometimes the accompanying sound.

Appendix 2. Examples of documents



Unesco journal of information science, librarianship and archives administration

Vol. IV, No. 3, July-September 1982

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POUR OBTENIR		
LE GRADE DE DOCTEUR ES SCIENCES NATURELLES		
Par		
Henri Noël LE HOUEROU		
Première thèse. — LA VÉGÉTATION DE LA TUNISIE STEPPIQUE avec référence aux végétations analogues d'Algérie, de Libye et du Maroc)		
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	Ch. SAUVAGE	
	A. PONS	
Mlle	J. CONTANDRIOPOULOS <i>Maitre de Recherches au CNRS</i>	
Annales de l'Institut National de la Recherche Agronomique de Tunisie Tunis 1969 - vol. 42 - fasc. 5		

A thesis.

INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE

L'HYDROBIOLOGIE A L'I.N.R.A.

4 années de Recherches

1969 - 1972

présentées par R. VIBERT
Chef du Département d'Hydrobiologie

Editions S.E.I.
C.N.R.A. - Versailles

A report.

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INTER-AFRICAN BUREAU FOR SOILS
B.P. 1352, Bangui, République Centrafricaine**

**SOLS AFRICAINS
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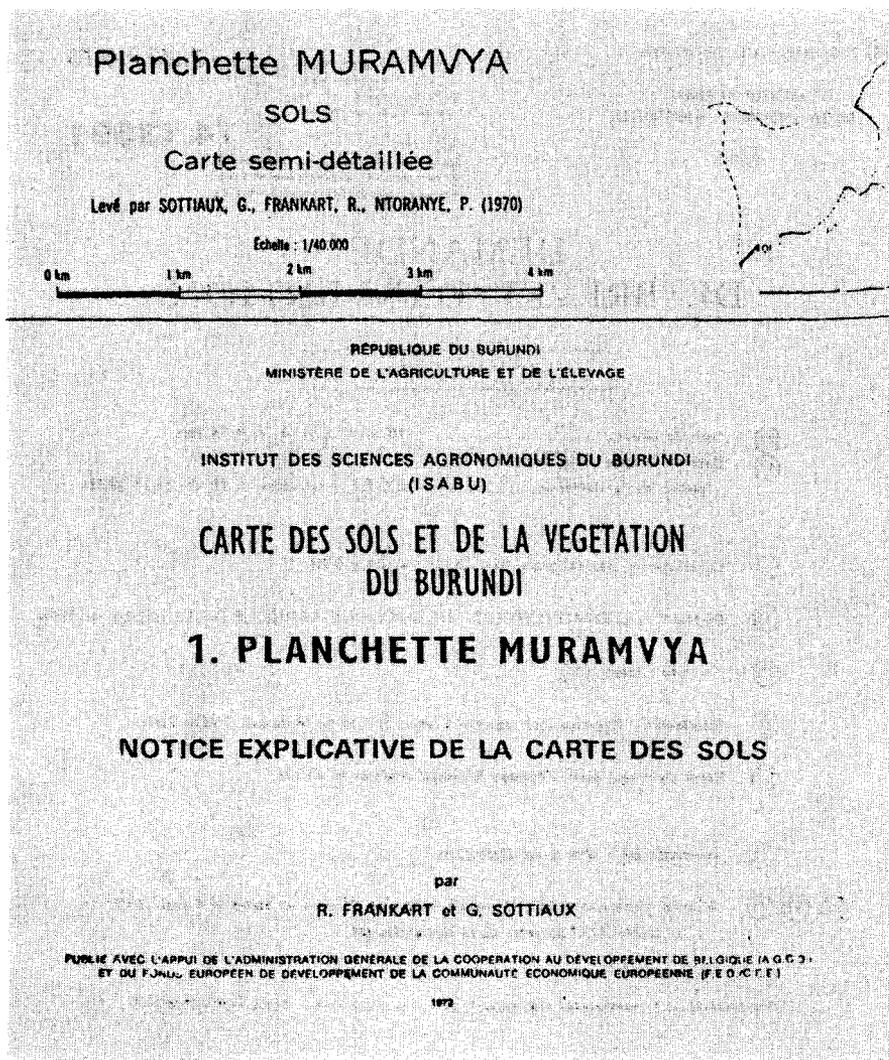
(54) **Barre de coupe pour l'élagage mécanisé d'arbres et autres.**

(72) Invention de : Pier Luigi Garagnani.

(33) (32) (31) **Priorité conventionnelle : Demande de Brevet déposée en Italie le 4 mai 1973,
 n. 3.393 A/73 au nom de la demanderesse.**

Verser des timbres à l'IMPRIMERIE NATIONALE, 27, rue de la Convention - 75332 PARIS CEDEX 19

A patent document.



A map.

2 Bibliographies and reference works

Reference works

Reference works are the most important tools used in searching for information. Each type of query is served by a type of reference work which makes it possible to provide the requested information, indicate a potential source of information or clarify the contents and limits of the query.

All reference documents are 'secondary' or derived documents, that is, based on original or 'primary' documents; they do not contain new knowledge but repeat and organize knowledge that is already available.

A distinction is made between: (a) bibliographies and catalogues which refer to other documents; (b) encyclopedias and dictionaries, which refer to ideas and/or specialized terms (handbooks and annual reviews may be placed in this category); and (c) directories, which provide names, addresses and practical information. These works are sometimes referred to as 'for consultation' and are intended to guide research rather than to be read from beginning to end.

There also exist directories of reference works such as directories of directories, bibliographies of bibliographies, guides to the available encyclopedias, etc.

Bibliographic directories

These cover a wide range of items. The term bibliography has several meanings: (a) the science of books, not dealt with in this work; (b) an exhaustive or selective list of documents on a subject; and (c) a periodical list of newly published documents.

There exist various types of bibliography: (a) international general bibliographies, or 'universal bibliographies', now no longer produced; (b) national general bibliographies, of which the most typical example is the 'national bibliography'; and (c) special bibliographies.

Some bibliographies are only compiled once to meet a particular request

or need while others, known as current bibliographies, are produced on a regular basis.

The national bibliography is the list of publications, textual or otherwise, produced in the country concerned and usually subject to legal deposit. Legal deposit is the requirement whereby printers and publishers have to submit a fixed number of copies of the documents they produce to a body officially designated to receive and conserve them (generally the national library or national archives, or for audio-visual documents, the national film and sound archives). This list is usually issued by instalments at regular intervals (weekly, monthly or quarterly) and, in some cases, each issue distinguishes between the various types of document: books, periodicals, iconic documents, maps, official publications and so forth. In countries producing a large number of documents, compilation of the national bibliography has been computerized and the lists are available in machine-readable form (the United States of America, the United Kingdom and the Federal Republic of Germany, for example). The Universal Bibliographic Control (UBC) project will permit exchange and cumulation of these lists by the adoption of standard rules for description and presentation.

The purpose of a national bibliography is (a) to keep users regularly informed of the national production of documents, and (b) to permit retrospective searches, that is, to enable even very old documents belonging to the national collections to be located. Retrospective search is facilitated by the fact that the successive issues of the list are usually gathered together in an annual volume which orders the documents in different ways, by title, publisher, subject or type of document.

For example, the Ivory Coast has a retrospective national bibliography¹ and a current national bibliography.²

Special bibliographies cover documents dealing with a single subject and inform the reader of what exists on the subject in one or several countries and one or several languages. They list all sorts of documents: books, periodicals, theses, patents, official documents, etc.

The bibliographies or directories of articles appearing in periodicals generally specialize in a particular subject and list all the relevant articles; they appear at regular intervals (e.g. *Analyses africanistes/African Abstracts*, a quarterly published by the International African Institute in London).

The bibliographies of periodicals, also known as catalogues or directories of periodicals, list the titles of periodicals, either in general or on a particular subject and have either a national or an international coverage.

Bibliographies may be classified according to:

Their periodicity: a current bibliography appears at regular intervals, listing documents as they come out, whereas a retrospective bibliography lists only those documents published during a fixed period of time.

The processing of documents: a descriptive bibliography simply provides a biblio-

1. G. Janvier and G. Peron, *Bibliographie de la Côte d'Ivoire*, 3 Vols. 1972/73.

2. *Bibliographie de la Côte d'Ivoire*, Bibliothèque Nationale, 1969.

graphic description of the documents mentioned whereas an analytical or annotated bibliography supplements this description with an analysis or abstract, and a critical bibliography adds comments.

Scope: an exhaustive bibliography lists all the documents relating to a given subject from a national or international point of view, whereas a selective bibliography deals only with those documents meeting certain criteria.

The contents of these bibliographies may be presented in various ways: in alphabetical order, in a systematic order (under a set of headings), or in chronological order (by date of publication). Consultation may be simplified by indexes of authors, subjects, places, patent numbers, organizations, etc. Scientific works such as theses always include a bibliography, as do most scientific papers. They often mention little known or highly valued documents on their subject but they cannot be regarded as exhaustive and have to be supplemented in the search for information by systematic current bibliographies.

Catalogues

Catalogues are lists of all the documents conserved in an information unit, and are arranged in a specific order, by author and anonymous works, by subject, by geographical names or by titles. They indicate where the documents mentioned may be found, which a bibliography does not generally do. Any document acquired by an information unit has to be registered in its catalogue.

Catalogues may take three forms: (a) alphabetical, the most simple type; (b) systematic, according to a list of headings; and (c) topographical, according to the call number of the documents indicating where they are shelved in the storage rooms.

The entries can be grouped together in printed volumes, with the advantage that they can then be distributed to various information units and users to facilitate searches. With library automation, catalogues are increasingly derived from a machine-readable data base which makes it possible either to produce cards or printed lists which can be directly interrogated when searching.

The catalogues of serial publications (periodicals) are often compiled on special cards, called Kardex, which allow the unit to check that each issue has been delivered. For this type of document, large information units have a special catalogue which is increasingly managed by computer.

Union catalogues group together the catalogues of several libraries into a single list. There exist union catalogues for books, such as the National Union Catalog, a cumulative list of the cards in the Library of Congress and other libraries in the United States of America. They serve to locate documents in the networks of information units, to facilitate inter-library loan, and to plan acquisition policies.

Trade catalogues are lists of the products manufactured or distributed by a company or group of companies. Many of them include a short description of the

product and reference data. They make known the range of products available so that they can be ordered directly. Publishers' catalogues present the list of books they have produced and which are in print.

In some cases, professional associations publish cumulative catalogues of the main products available on the market together with the addresses of manufacturers. This is often done in a special issue of the journal put out by the organization concerned. The catalogues of fairs and specialized exhibitions play a somewhat similar role though they contain a smaller selection of items.

Dictionaries and terminological works

These also take various forms. The very word 'dictionary' stands for two quite different documents (a) a compendium of the words in a language arranged in alphabetical order and defined in the same language; and (b) a compendium of the words in a language translated into one or more other languages (bilingual or multilingual dictionaries).

A glossary is a kind of dictionary that translates the technical terms of a language into more normal and easy-to-understand words of the same language together with, in some cases, the equivalent term in one or more foreign languages. Technical books often have to contain glossaries in order to be understood.

Lexicons or vocabularies are dictionaries covering a usually restricted field and may also provide the translation of terms into one or more foreign languages. They include an explanation of the terms listed (for example, 'Lexicon of data processing' or 'Vocabulary of geography').

Dictionaries of biography give a brief account of the lives and works of people who have acquired a certain reputation. Their notices are arranged in alphabetical order and if necessary by country or subject field. They may be international and encyclopedic (e.g. *International World Who's Who*) or specialized by profession or branch of activity (e.g. *Who's Who in Data Processing*), or national and encyclopedic (e.g. *Who's Who in Africa*) or specialized.

There also exist dictionaries of pseudonyms enabling one to find out the real identity of people. Biographical dictionaries make it possible to check a person's name and identify people who could be the source of information on a subject.

Encyclopedias

Encyclopedias contain fairly long articles presenting the current state of knowledge on all subjects (universal or general encyclopedias) or in one field (specialized encyclopedias). They may be set out in two ways: as dictionary-type encyclopedias in which the topics are covered in alphabetical order, or as systematic encyclopedias

in which the topics are arranged in accordance with a special list of headings.

Unlike dictionaries, encyclopedias do not include all the words or concepts of a language on all subjects or on a given subject but select certain major themes, which are then thoroughly discussed by specialists. As a rule, they include a subject index and are used to clarify the terms and content of a query.

Textbooks and treatises set forth the main concepts related to a subject and/or scientific discipline. They are primary documents offering a general overview of the subject field concerned by the search. Some of them fulfil the same function as specialized encyclopedias.

There also exist tables, compendia and handbooks, which draw together known data in a scientific field (e.g. *The Chemical Engineer's Handbook* or *The Standard Handbook for Civil Engineers*) and supply the answers to specific practical questions. Some of these compendia are published as periodicals (e.g. *The Journal of Physical and Chemical Data*).

Periodicals, annuals for the most part, with titles such as 'Yearbook', 'Annual Review', 'Advances in . . .' and so on provide another way of keeping up with progress in certain disciplines or problems. They generally review a large proportion of the relevant literature published during the period covered and therefore serve as both bibliography and encyclopedia to guide searches and identify sources of information. Statistical yearbooks present systematically arranged standard series of data with a national or international coverage (e.g. *The United Nations Statistical Yearbook*) and focused either on all the social and economic aspects of the country under review or on certain branches of activity (e.g. *The Yearbook of Labour Statistics*).

Compendia of law and case-books, updated at regular intervals or whenever necessary, are a means of keeping up with changes in regulations or the law, and may thus provide the answers to specific queries or clarify their implications and point to appropriate sources. To this category may be added atlases, which assemble data, in map form, on a particular country or region or on the world in general.

Directories

Directories provide information on individuals, organizations or documents existing at a particular point in time or in a specific field. The following types may be distinguished:

Directories of available books, i.e. books in print and on sale, (for example, '*Les livres disponibles 1977*' | *French Books in Print*, which contains some 220,000 titles of works in French from forty-three countries).

Directories of forthcoming books, which list the books which are due to come out on a subject (for example, *British Books in Print*; *The Reference Catalog of Current Literature*).

- Directories of organizations (sometimes called yearbooks), which are usually specialized and give the address and a brief description of organizations engaged in a particular field at the national or international level (for example, *Répertoire Mondial des Institutions en Sciences Sociales/World Index of Social Science Institutions*). Government directories list the institutions of a state. Professional directories and yearbooks list all the firms and specialists in a branch of activity and usually include subject and geographical indexes.
- Directories of people, members of associations or professional organizations give the names and addresses of those engaged in a certain branch of activity, together with their specialist field and functions but, unlike biographical directories, do not refer to their lives or works. General-purpose directories, such as telephone directories, provide another useful means of locating sources of information.
- Directories of research projects or of ongoing or recent research, which are usually published for a specialist field or discipline by the organization in charge of the research, by the funding agencies or by national centres (for example, *Information Services on Research in Progress/Services d'information concernant les recherches en cours*, a worldwide inventory published in 1978 by Unesco and the Smithsonian Science Information Exchange). They generally include succinct but sufficient details on the aim and progress of the research in question.
- Directories of theses in preparation or successfully defended (i.e. passed by a jury), published either by the relevant academic authority or university or by a central national agency, are useful as a source of information in the making but have the same drawbacks as research directories: they do not indicate the state of progress or whether the thesis has been abandoned. There are also directories of theses by discipline (for example, *Inventaire des thèses et mémoires africanistes de langue française soutenus* (List of Successfully Defended French-language Theses and Papers in African Studies)).
- Directories of contracts, which mention the research and studies financed by a particular body or by all national organizations supporting the work of research teams (e.g. *Foundation Grants Index*).

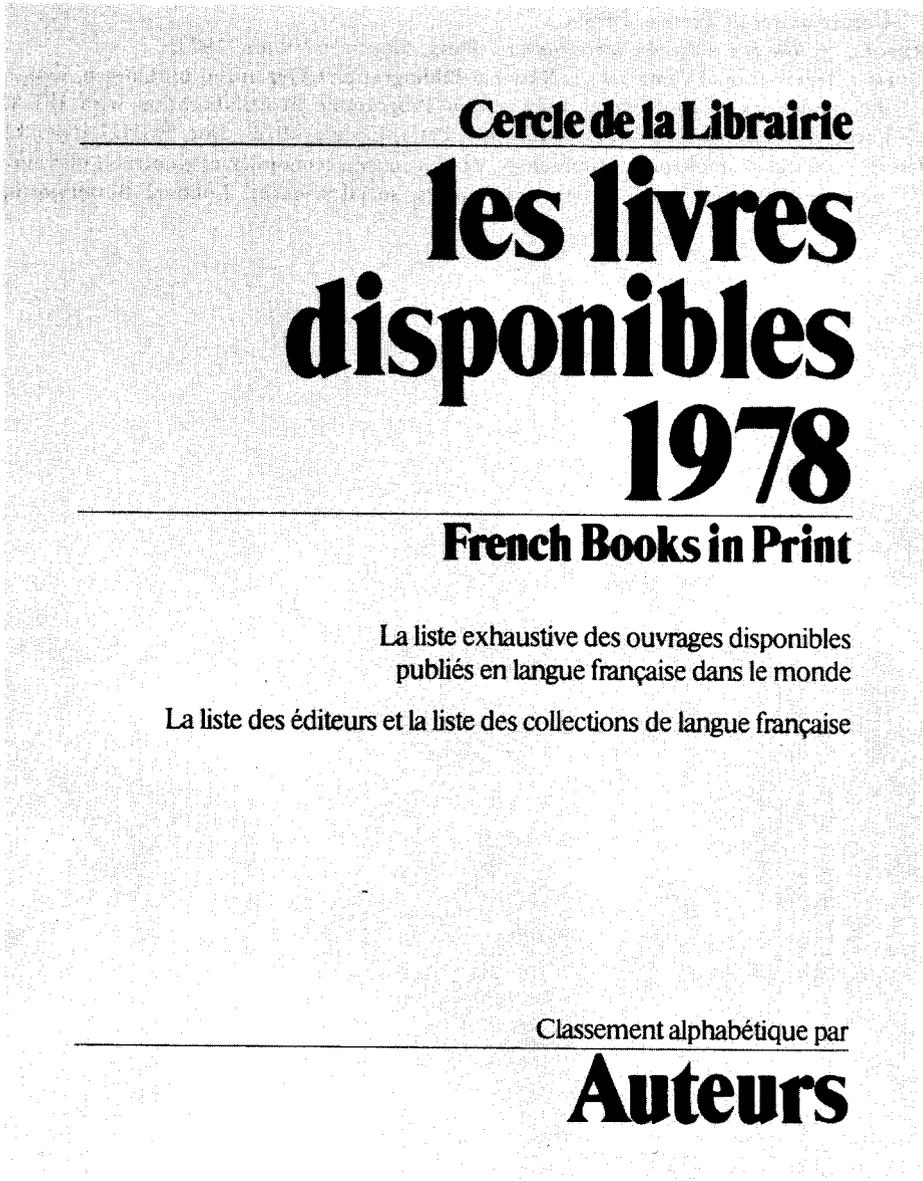
Check questionnaire

- What is a national bibliography?
What is a dictionary for?
What are the different types of bibliography?
What is the purpose of a directory of organizations?
What information is to be found in a biographical dictionary?
What is the difference between a dictionary and an encyclopedia?
What are the different types of directory? Give a few examples.

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- Use of . . . literature* (biological, criminology, earth sciences, economics, engineering, management and business, medical, physics, reports, social science). London, Butterworth, 1971.

Appendix. Examples of bibliographies and
reference works



SECRETARIAT D'ÉTAT AUX UNIVERSITÉS

CATALOGUE GÉNÉRAL
DES LIVRES IMPRIMÉS
DE LA BIBLIOTHÈQUE NATIONALE

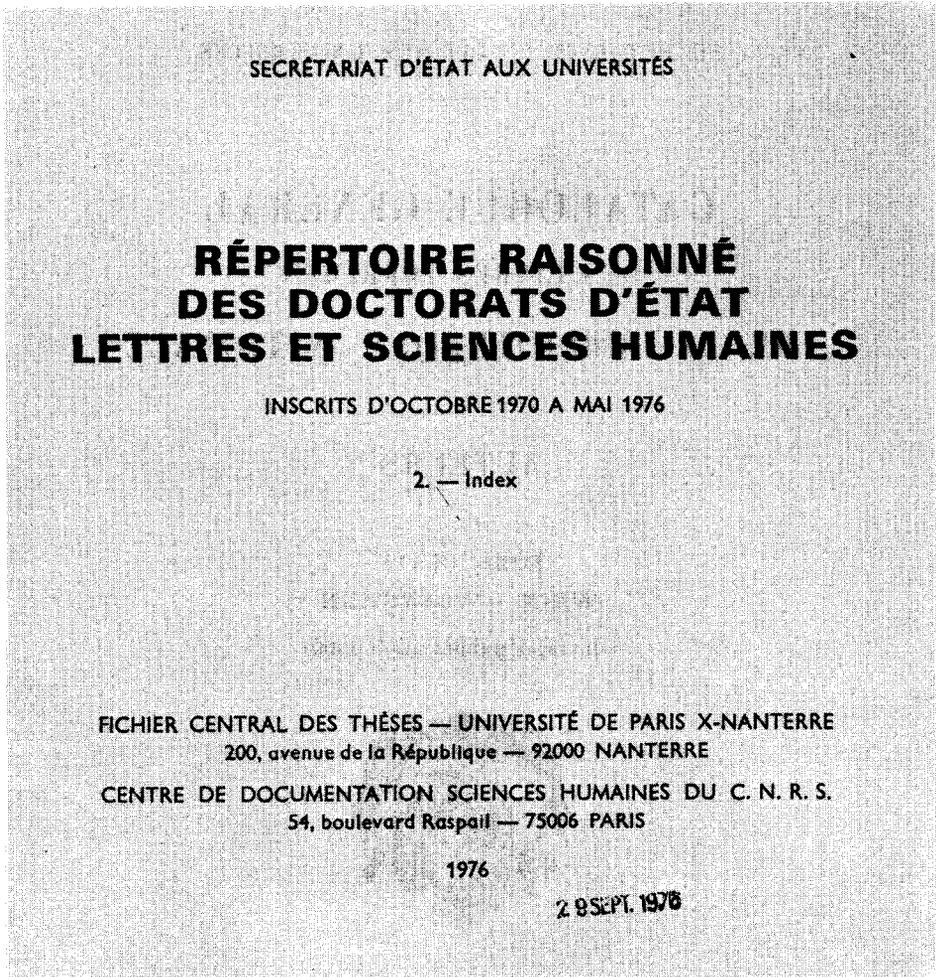
AUTEURS

TOME CCXXV
WINN - WOEYSTEIN
(Ouvrages publiés avant 1960)



PARIS
IMPRIMERIE NATIONALE

MDCCCLXXVI



A directory of theses.

**répertoire
international
des éditeurs
et diffuseurs
de langue
française
1978**

**CERCLE DE LA LIBRAIRIE
117, boulevard Saint-Germain
75279 Paris-Cedex 06**

A directory of publishers.

1^{re} PARTIEBIBLIOGRAPHIE SIGNALÉTIQUE
DES OUVRAGES ET ARTICLES FRANÇAISPRÉPARÉE PAR
LA BIBLIOTHÈQUE NATIONALE

I. LES DOCUMENTS

PRODUCTION ET REPRODUCTION

1. — BERSIER (Jean E.). — La Gravure : les procédés, l'histoire... — [2^e éd.] — Berger-Levrault, 1974. — 435 p. : ill. ; 25 cm.
2. — BOILLAT (Gabriel). — La Librairie Bernard Grasset et les lettres françaises... — H. Champion. — 23 cm. I. Les Chemins de l'édition : 1907-1914. — 1974. — Bibliogr., 293-304.
3. — FRÈREBEAU (Mariel). — L'Imprimerie en taille-douce : histoire des institutions et des techniques. (In : *Nouv. de l'estampe*. N° 16, juil.-août 1974, 11-15.)
4. — LABARRE (Albert). — Histoire du livre... — 2^e éd. mise à jour. — Presses universitaires de France, 1974. — 126 p. ; 18 cm. — (« Que sais-je »... ; 620.)
5. — Microéditions Hachette : [Catalogues de microfiches]. — Hachette [1971] (n° 1). — 21 cm. Collection. — Chaque fasc. consacré à un sujet donne la liste des microfiches éditées.
6. — Poliakov (Serge) : les estampes / [cat. établi par Alexis Poliakov]. — Arts et métiers graphiques, 1974. — 117 p. : ill. ; 28 cm.
7. — RENNERT (Jack). — 100 ans d'affiches de cycle. — H. Veyrier, 1974. — 112 p. : ill. ; 41 cm.
8. — Soulages : eaux-fortes, lithographies. — Arts et métiers graphiques, 1974. — 143 p. : ill. ; 28 cm. Cat.
9. — VICAIRE (Georges). — Manuel de l'amateur de livres du XIX^e siècle : 1801-1893... / préf. de Maurice Tournoux. — Paris : A. Rouquette, 1895 ; Brueil-en-Vexin : Éd. du Vexin français 1974. — 24 cm. 1. A-B. — XIX p. — 990 col. 2. C. — 1098 col. Réimpr.
10. — WOIMANT (Françoise) et ELGRISHI (Marcelle). — Répertoire des imprimeurs de gravures en France : taille-douce, bois, linogravure, enquête... (In : *Nouv. de l'estampe*. N° 16, juil.-août 1974, 17-28.)

DIFFUSION

11. — Les Exportations de livres français au premier semestre 1974. (In : *Bibliogr. de la France. Biblio.* N° 47, 20 nov. 1974, 2^e partie : Chron., 971-977.)
12. — Sur le prix du livre. (In : *Bibliogr. Bull. Bibl. France*, Paris, vol. 20, n° 1, 1975)

ISSUE 6 NOVEMBER-DECEMBER 1981

ABSTRACTS 81/5014-81/6021

Name and subject indexes are printed as an inset on tinted paper in the middle pages.

Notes on the classification scheme, the filing order for classification symbols, photocopies of original materials and abbreviations of journal titles are given on the inside covers.

A—LIBRARIANSHIP

- A 81—Viewpoint of Roberts, D.** 81/5014
A conversation with Don Roberts. Milton Wolf. *Technicolites*, 1 (2) Jan 81, 6-7, 14.

Excerpts from a telephone interview with Don Roberts (contributor to major library periodicals and advocate of audio-visual services) in Oct 80; the concluding extracts are to be published in a future issue. Topics covered include differences between commercial organisation and public institution attitudes towards librarianship, information, and the use of modern technology, the librarian as a political animal, and the White House Conference on Library and Information Services. (S.D.)

- AC3—Future developments** 81/5015

Changing times: changing libraries. George S. Bonn, Sylvia Faibisoff. Urbana-Champaign, Illinois University Graduate School of Library Science, 1978. 166p. ERIC report. ED-183 139.

Collection of essays and responses by 18 specialists and librarians focusing on 3 research perspectives: (1) governmental, economic, and technological changes; (2) possible results of change in the humanities, education, and social institutions; and (3) the process of change and ways to create conditions for change. Each specialist's essay is followed by a librarian's response which highlights the essay's implications for librarians and expresses a point of view. Report not available from NTIS. (NTIS abstract—amended)

- AC3—Future developments. Forecasting** 81/5016

Futures research in librarianship. Elizabeth Morrison. *Library Research*, 2 (3) Fall 80, 195-213. bibliog.

Literature review of works relating to futures research in librarianship. Analysis of future trends is used as a means of studying present problems. Also examined is the application of the methods of futures research within librarianship. Literature of librarianship published in North America, the UK and Australia, mainly during the 70s, is covered. (D.A.C.)

- ADR—Developing countries** 81/5017

Third World libraries and cultural imperialism. Graham K.L. Chan. *Fiji Library Association Journal*, (3) Aug 80, 11-19. 2 refs.

Originally published in the *Assistant Librn*, 72 (10) Oct 79, (see 80/4104). (D.A.C.)

- AD431—East Germany** 81/5018

The Library System of the German Democratic Republic. Wilfried Kern. *IFLA Journal*, 7 (2) May 81, 94-112. illus. tables.

The evolution of the East German library system as part of the planned development in the whole social life of East Germany is traced from 1945. Regulations and Acts concerning library development are reviewed. Libraries with nationwide functions, public libraries maintained by the State, university and college libraries, business libraries, special State libraries, and museum and archival libraries are covered, as are the methods of cooperation between these various libraries. Networking, interlending, management, research and training are also reviewed. (Original abstract)

- AD433—West Germany** 81/5019

København's Kommunes Biblioteker: internationale studierisø Oktober 1980. [Copenhagen's community librarian: international study trip, October 1980]. Brita Olsson. *Biblioteksdienst*, (4) Apr 81, 357-363.

The writer last visited Germany in 1966 and comments upon the impressive reconstruction of the library service which has taken place since then. New branch libraries show the influence of Scandinavian design, but bookstocks are still about half the Scandinavian average, and it is doubtful if sufficient planning has been made for future expansion. Most libraries are open-plan, with no division between adult and juvenile sections. Many central libraries badly need new premises, but all of them offer a very wide range of activities. The lack of a standard classification was noted as an obvious disadvantage. It was felt that there was scope for cooperation between German and Scandinavian libraries in making provision for minority immigrant groups in the community. (A.J.K.)

- AD436A—Austria. Conferences. Österreichische Bibliothekartag** 81/5020

(1980)
Der 16 Österreichische Bibliothekartag. [16th Austrian Librarians Conference.] Michael Stücker. *Biblas (Austria)*, 29 (4) 1980, 300-311. tables.

A joint event, held in Krensimünster from 3rd to 6th Sept 80, where the Benedictine monastery celebrated the 1200th anniversary of its foundation. The theme was therefore antiquarian books—their heritage and their preservation. In addition to speakers on this theme there was discussion of current topics, especially the question of regional bibliographies, cataloguing rules and the use of computers. Statistics for Austrian libraries for the year ending Dec 79 are tabulated and bookstocks, staffing, readership and issues in university libraries and institutes, regional and municipal libraries, teacher training colleges and government libraries are analysed. (A.J.K.)

A—LIBRARIANSHIP (Continued)

- AD489—Denmark** 81/5021

Bibliotekerne har været udsat for en reel diskriminering. [Librarians have been subject to real discrimination.] Kr. Lindbo-Larsen. *Bogens Verden*, 62 (10) 1980, 631-635. illus.

Discusses the need for equality of library service to be written into the new Library Act. There should be no dispensation from the demand that library leaders must be qualified. The savings circular was put forward in 1980 in the fear that expenditures would rise by 5%, but it has meant that local authorities can no longer decide which areas are to be given priority. Thanks to the state grant earmarked for development new buildings continue to be built, among them Aalborg public library. Mentions services to the blind and other handicapped carried out by Rødovre and Århus. Discusses problems of privacy of information caused by the introduction of computer controlled lending. Services to immigrants and the position of school libraries are also discussed briefly. (E.L.D.)

- AD511Aw—Chinese People's Republic. Australian viewpoint. Study tours. National Library of Australia** 81/5022

NLA delegation's visit to China. Judith Baskin. *Aust. Acad. Res. Libr.*, 12 (1) Mar 81, 35-40.

Briefly describes a visit to the People's Republic of China by 4 National Library of Australia staff, 6-21 Jan 80, and its results. The main purpose of the visit was to discuss developments in the Chinese and Australian national libraries and exchange of material. The Australians went on guided tours round Peking National Library and a number of academic and national libraries in Peking, Shanghai, Hangzhou, and Guangdong. Throughout, there was a clear need for more trained librarians, automation (great interest was shown and information has been sent from Australia to a number of Chinese institutes), Western information, and greater contact with Australia. The visitors were impressed by the large number of library users and the dedication and enthusiasm of librarians. (S.D.)

- AD541Ag—India. Conferences. All-India Library Conference** 81/5023

(1981)
Conference number. *Indian Libr. Ass. Bull.*, 17 (1) Jan-Mar 81, 1-93. tables. refs.

Issue devoted to papers on the topics 'A second look at the library legislation in India' and 'Stock verification of reading materials in libraries: its concept, rationale, methods and practices', presented at the 27th All India Library Conference, Hyderabad, 9-12 Jan 81. For abstracts of the individual papers see the following serial numbers:

5381; 5382; 5383; 5384; 5385; 5703; 5704; 5705; 5706; 5707; 5708; 5709; 5710; 5711; 5712; 5713; 5714; 5715

A supplement containing papers received late is being published. The Conference was sponsored by the Academy of Library Science and Documentation, Hyderabad. (S.D.)

- AD667—Ghana** 81/5024

Bibliotekwezen in Ghana: geschiedenis en ontwikkeling. [Librarianship in Ghana: history and development.] G.J.H. Van der Moolen. *Openk*, 13 (4) Apr 81, 197-204. 20 refs.

In recent years library services in Ghana have undergone rapid expansion. The 1st public library was opened in 1928 in the Bishop's Boys' School with 6,000 books donated by the Anglican Church. In 1944 the British Council appointed a library advisory commission for Ghana, as a result of which the Council organised a network of book boxes and mobile libraries. In 1950 the Ghana Library Board was created with representatives from the regional councils, the Teaching Committee and the British Council. At the suggestion of the Library Board a national library was founded in Accra with a network of regional libraries throughout the country. However, an inefficient banking system and currency exchange problems present considerable difficulties for librarians in the acquisition of foreign literature. (P.W.)

- AD67Aw—Tanzania. Danish viewpoint** 81/5025

Nytten af biblioteksvæsenet i Tanzania er tvivlsomt. [The usefulness of the library service in Tanzania is doubtful.] Mogens Vestergaard. *Bogens Verden*, 62 (9) 1980, 594-599. illus. 1 ref.

Describes the current library situation in Tanzania on the background of a study trip in Jan 80 and critically examines Steffen Gram's *The book—key to development: the story of Tanzania's library service*, Danida, 1978. Book production is mainly aimed at the educational sector, and the task of the library sector is also largely dictated by educational needs. The rural book collections consist of Adult Education Collections, which are independent of the Dar es Salaam based Tanzania Library Service (TLS). There are 15 regional and 5 district libraries, all with inadequate and outdated collections, partly owing to the scarcity of books in Kiswahili. Praises Danish aid, but the lack of foreign exchange needed for maintenance of equipment and running of the projects leads to ultimate waste. The aims of TLS are described in the Library Act of 1975, but they are criticised for giving priority to a documentation service and not to rural libraries. (E.L.D.)

- AD6891Ag—Zimbabwe. Conferences. Rhodesia Library Association. Annual Conference** 81/5026

Annual Conference, 1979: a summary. H. Robertson. *Zimbabwe Librarian*, 11 (1&2) Jan-June 79, 3, 5-7.

Short summaries of papers presented at the Rhodesia Library Association Annual Conference, University of Rhodesia (Salisbury), 31 Mar-1 Apr 79. There were 5 sessions, covering school libraries, other education libraries, special libraries, library training, and public libraries. (S.D.)

D

- D.A.T.A. Book of discontinued transistors** [Derivation and tabulation associates] (Orange N.J., USA)
4469 P
- D.A.T.A. Semiconductor, diode and silicon controlled rectifier characteristics tabulation** (West Orange N.J., USA)
— Devient en 1969 : **Semiconductor, diode and Silicon Controlled Rectifier** | D.A.T.A. book
- D.A.T.A. Transistor characteristics tabulation** [Derivation and tabulation associates] (West Orange N.J., USA)
— Devient en 1967 : **Transistor D.A.T.A. book**
- D.D.R. Verkehr** (Berlin, DDR)
430
- D.F.W. Dokumentation. Fachbibliothek. Werksbucherei** (Hannover, D)
151
- D.I.N. Mitteilungen. Deutscher Normenausschuss** (Berlin, D)
423
- D.I.S.A. Information** (Herlev, DK) — Voir : **Disa Information**
- D.K.-Mitteilungen. Ausschuss für Klassifikation im deutschen Normenausschuss** (Berlin, D)
1 - 34 CfUM - 1808 NaU - 5076 LU
- D.N.Z. Deutsche Nähmaschinen-Zeitung** (Bielefeld, D)
— Devient en 1966 : **D.N.Z. International**
- D.N.Z. International** | Deutsche Nähmaschinen-Zeitung | (Bielefeld, D)
99
- D.O.B. Praxis. Zeitschrift für Fachtechnik und industrielle Fertigung von Damenoberbekleidung** (München, D)
815
- D.R.P. (The) bulletin** [Democratic Republican party] (Seoul, HG)
1
- D.S.H. Abstracts** [Deafness, speech and hearing abstracts] (Washington D.C., USA)
99
- D.V.L.-Nachrichten. Mitteilungsblatt der Deutschen Versuchsanstalt für Luft- und Raumfahrt** (Mülheim, D)
99
- D.V.Z. Deutsche Verkehrs-Zeitung** (Heidelberg, D)
524
- Dacia. Revue d'archéologie et d'histoire ancienne** (București, R)
16 U - 46 RU - 5592 MpU
- Dados. Instituto universitario de pesquisas** (Rio de Janeiro, BR)
137 - 2346 I
- Daedalus. Journal of the American academy of arts and sciences** (Cambridge Mass., USA)
26 AU - 47 TU - 462 - 4483 GI - 5500 - 5822 U
- Daftar 'ba-ye rowzan** (Tehran, IR)
54
- Dag Hammarskjöld library. Bibliographical series...** (New York N.Y., USA)
39 LU
- Dag Hammarskjöld library. Current issues** (New York N.Y., USA)
VI BU
- Dagblad scheepvaart** (Rotterdam, NL)
5949
- Daha'ir al-Arab** (Le Caire, E)
4
- Daily worker** (London, GB) — Devient en 1966 : **Morning star**
- Da'irat al-Ma'arif il-Osmania publications** (Bandarabad, IN)
4
- Dairy (The) farmer and dairy beef producer** (London, GB)
4332 P
- Dairy goat journal** (Columbia Ohio, USA)
4332 P
- Dairy industries** (London, GB)
529 - 5917 - 5937 P
- Dairy produce. Commonwealth secretariat. Commodities division** (London, GB)
137
- Dairy research institute. Publication** (Palmerston North, NZ) — Devient en 1966 : **New Zealand dairy research institute. Publication**
- Dairy science abstracts** (Shinfield, GB)
5917 - 5961 CU
- Dakar-matin** (Dakar, SN) — Devient en 1970 : **Soleil (Lé)**
- Dalhousie dental journal** (Halifax, CDN)
424
- Dalhousie review** (Halifax, CDN)
873
- Dahl al-ihya' al-talimi** (Al-Riyad, SA)
5984
- Dal'nevostochnyj gosudarstvennyj universitet. Učenyje zapiski** (Vladivostok, SU)
12 U
- Dal'nevostochnyj gosudarstvennyj universitet. Učenyje zapiski. Serija ekonomičeskaja** (Vladivostok, SU)
12 U
- Dal'nij Vostok. Literaturno-khudožestvennyj i obščestvenno-političeskij žurnal** (Khabarovsk, SU)
54 - 102 I

British National Bibliography

A Subject Catalogue of new British books received by the Copyright
Receipt Office of the British Library, arranged according to the
Dewey Decimal Classification and catalogued according to the
British Text of the Anglo-American Cataloguing Rules, with a full Author
& Title Index, and a Subject Index

1980

Volume 1: Subject Catalogue



The British Library BIBLIOGRAPHIC SERVICES DIVISION

3 Selection and acquisition

Selection is the act of choosing the documents which the information unit wishes to acquire and acquisition refers to the procedure followed to obtain them. The two operations take place at the beginning of the documentary chain and are used to build up and maintain the 'collections' or set of documents needed to satisfy requests for information and attain the unit's objectives.

The selection of documents is a delicate intellectual operation best left to a senior member of the staff competent in the field concerned and working in co-operation with the users. Acquisition is a technical routine requiring a methodical approach and good organization.

Acquisition policy

An acquisition policy is vital: acquisitions are not left to chance but represent the outcome of a succession of formal decisions which, taken together, constitute the information unit's acquisition policy. This policy takes a number of factors into consideration:

The unit's budget and available resources: total funds, size and qualifications of the staff. It is, of course, not enough simply to acquire documents, the unit must be capable of processing those obtained.

The specialist field and discipline with which the unit is concerned: once defined, these determine the comparative importance of documents and their relevance to the unit's collections and user needs.

The current objectives and priorities of the unit: not everything can or should be acquired.

Type of unit: legal status, size, function.

Type of service offered and type of user served.

Relations with other information units as a potential basis for exchanges or the shared use of a common collection, and the state of information processing in the specialist field concerned (existence or non-existence of a network, remoteness from other units).

Tracing of documents

Documents are traced through a series of complementary information sources, such as individuals, organization, other documents, depending on whether those wanted are published or not.

Subject specialists are a vital source of information and the unit should keep in regular contact with them since professional associations, groups and the information circles known as 'invisible colleges' which subject specialists gradually establish among themselves produce documents with the latest information and most recent developments. Specialists may be approached directly, through regular professional contacts with authors, research institutions, specialized documentalists and all other bodies actively involved in one way or another with the field covered by the information unit; or they may be approached indirectly, by using specialized directories.

Because of **their variety and specific functions**, the other information sources need to be cross-checked one with another. Secondary and/or tertiary documents group together and list the documents produced. They include abstracting and indexing services, national and special bibliographies, the bibliographies contained in primary documents, the catalogues and files of other units, publishers' catalogues and announcements, trade literature issued by firms to advertise their products, citation indexes, directories of periodicals and official publications, the critical articles and reviews of specialized journals, syntheses, annual reviews and state-of-the-art reports: in short, the trade literature accompanying production on the one hand and on the other search and analysis tools developed by information specialists. For each type of document sought there exist one or more types of publication by means of which it can be identified.

Some documents (books or objects) may be requested from the publisher 'on approval', that is, for examination and possible return if not suitable.

Tracing of non-published documents raises special problems. Non-conventional literature—theses, reports, conference memoranda, preprints, etc.—can be found in two ways: first, directly through personal contact with authors and organizations which produce them regularly, and in a general way with people well informed about current development in the field; second, indirectly, by hunting through bibliographies in books and theses since their authors often mention non-published documents, or by examining citation indexes and the publications, catalogues of government agencies and national and international organizations such as Unesco, FAO, OECD, etc., which both produce and receive a great many non-published documents; others can be traced through specialized directories—of Ph.D. theses for example—or through the reports on government-funded research. These acquisition lists and directories must be systematically obtained from the organizations and governmental agencies concerned.

The tracing and acquisition of documents call for a sustained effort on the part of the information unit, which must be constantly on the watch, anticipating the emergence of information and tracking down sources to make sure that the

most recent work of an author is received. However, the value of such documents justifies the time and energy spent in listing and obtaining them.

The documents produced by the organization to which the information unit belongs, i.e. 'internal documents', constitute an indispensable source of information, though of uneven quality. Some of them, such as circulars, office memoranda and notices, rapidly become out of date and will only be kept when necessary by the archives services; but those that reflect the life and production of the organization should be systematically sought out and conserved. It is the job of the documentation service to collect them, without waiting for someone to forward copies.

Selection of the documents to be acquired proceeds by stages, in co-operation with users. If the information unit serves a particular kind of user with whom it is in constant touch, it should keep them informed of identified documents of possible interest and request suggestions as to future acquisitions.

The sorting-out process determines the utility of documents according to: (a) their nature: documents on carriers that cannot be used with the equipment available should be avoided; (b) the origin of the acquisition proposals, assessed in regard to the person's competence and representativity in relation to the body of users as a whole; and (c) user needs and external facilities such as private collections or exchange networks.

There may be other factors to consider, such as the quantity of documents (not only the number produced but the amount of storage space and equipment available), language, price, date and the importance attached to the type of information sought (e.g. if the stress is on current information, periodicals will be preferred to basic books).

The validity of the sorting-out process is checked in two ways: first, by a routine verification to ensure that the selected titles have not been ordered already or do not exist in another edition, in another form, or in a more accessible foreign language; care is also taken to see that the documents in question cannot be easily obtained on loan; and, second, by an 'intellectual' verification, whereby specialized users are asked to check the intrinsic value and usefulness of the selected documents.

The final decision on acquisition is then taken, either by the person in charge or by an 'acquisitions committee' of users and staff which holds regular meetings to discuss proposals. The final decision will take into account the need to maintain a proper balance between individual proposals and interests and general objectives and between the various branches of the field covered.

It is essential for users and information specialists to co-operate at every stage in this process, since their several criteria may overlap or even conflict. The final decision should be the out-come of arbitration, which will only be acceptable if the interests of each party are treated with mutual understanding.

Documents not selected can be rejected definitively or for the time being. In the latter case, the requests will be kept separately for later use if the need arises.

There are two ways of acquiring documents: by paying for them or by obtaining them free of charge.

Purchased acquisitions may be obtained by various means. They may be obtained directly from the producer of the document, i.e. its author, publisher or printer; this is the quickest procedure but requires much work in regard to budget control and ordering. They may be obtained indirectly through a book dealer who handles all the technical and financial operations; this is particularly advantageous in the case of foreign documents and when purchases are numerous and at frequent intervals. It is also recommended for medium-sized collections of periodicals because the control of subscriptions is a particularly burdensome and awkward task. Subscription orders have to be sent in several weeks in advance of the starting date desired as most publishers require payment before the first copy is dispatched. The cost of using an intermediary is easily offset by the reduced amount of work and the gain in time.

'*Shared acquisition*' is a method of purchasing documents whereby a number of information units form an acquisition network and share out the purchasing of certain documents. There are two sorts of agreement: the first is a general agreement whereby the information unit buying a document informs the others, who then refrain; the second is a systematic division whereby each unit buys only certain types of document defined by origin, language, nature or subject. It is agreed that the documents purchased in this way will be lent on request to the other units, along the lines of interlibrary loan. The steady development of loan schemes, together with photocopying and micro-reproduction, is helping this mode of acquisition to spread.

The advantages of shared acquisition are reduced costs and less duplication of effort, but it has some drawbacks related to the time taken to purchase the document and the delays for consultation if the document is not available.

Free acquisitions are of several kinds:

Exchange, or the sending of documents from one information unit or organization to another and vice versa. This system necessitates something to be exchanged — books in more than one copy or serving no further purpose in one of the information units, spare collections of periodicals or documents produced by the organization. It has the advantage of avoiding any direct outlay, especially in foreign currency, and makes it possible to exchange all kinds of documents including, in many cases more or less restricted literature. As for the disadvantages, the documents received do not always meet genuine needs and do not always match the value of those sent. Agreements have to be reached on the nature of the documents suitable for exchange, their value and their condition.

Donations, which may take various forms: bequests of private collections or groups, spontaneous regular gifts (e.g. by embassies, official agencies or commercial bodies), author's copies: many authors or producers of primary documents send their colleagues or information units two sorts of documents, 'preprints' concerning their work prior to publication (articles, study reports, communi-

cations, etc.) and copies of already published work such as reprints or books. These documents tend to be few in number and can be obtained either directly, through personal contact, or by making a request to the author. They serve as the basis for exchanges between scientists.

In addition to the foregoing types of donation, there exist 'requested donations'. The information unit asks the publisher or printer to give it a document which it can then make known to the public. This happens, for example, in the case of 'press copies' sent for review in a journal or broadcast. The great advantage of donations, of course, is that they cost nothing, but the drawbacks are considerable: it is impossible to choose in advance, it may be necessary to keep the entire donation together even if not all the documents correspond to the unit's objectives or priorities.

Legal deposit is a very special form of donation: the producers of documents (manufacturers, printers and publishers, but not authors) are required, at least in many countries, to give a fixed number of copies of all they produce to one or more beneficiaries, usually the national library or some other library performing this function. The advantages are that the beneficiary of legal deposit theoretically possesses all the printed and audio-visual documents produced in the country. Unfortunately, this obligation is not always respected and it does not always cover all types of document. In some countries, moreover, legal deposit does not exist. It is in fact only scrupulously respected in the case of patents, which inventors are obliged to deposit with a special agency for them to be officially recognized (i.e. have commercial value).

Certain constraints affect the acquisition process and prevent the unit from obtaining exactly what it would like:

Financial limitations: the information unit may be completely autonomous with the freedom to buy what it wants or it may depend on a central purchasing office and be obliged to respect deadlines, a certain distribution of the budget, and so forth. Purchases requiring hard currency may be out of the question. Limitations such as these are usually compounded by administrative constraints, such as internal or general procedures (exchange control among others) which sometimes add considerably to the delay or make it necessary to order well in advance. This inevitably causes the unit to fall somewhat behind the times, with the risk that some documents will be out of date on arrival.

Material limitations, such as available floor area, storage capacity, the possibility or otherwise of conserving certain fragile materials, and the need for certain pieces of equipment without which certain documents cannot be used.

'Intellectual' constraints: directives concerning an organization's information policy, political restrictions, the impossibility of establishing relations with certain national or foreign information sources, a contradiction between the desired acquisition policy and the economic situation, or the question of secrecy which prevents certain documents (military secrets, administrative, business or industrial secrets, private matters) from being disseminated.

Another type of constraint is related to the document's intrinsic possibilities for

exploitation by the personnel available, i.e. the accessibility of its subject-matter or language.

Acquisition procedures

Acquisition procedures follow a carefully planned sequence of steps. Before any document is ordered all the references are checked, including title, author, publisher, date, ISBN and ISSN numbers.¹ All these essential details must be exact. The information unit also checks whether it does not already possess the wanted document. The next step involves the following operations:

The filling in, in several copies, of an order sheet or form. In the case of a donated document or an exchange, the request can take the form of a standard duplicated ordering letter with a space left for the title.

The establishment of a double file for orders dispatched and orders received.

The sending of the order and, in the case of periodicals, payment of the subscription. A reminder if necessary.

On receipt of the document, two series of operations are carried out:

Operations related to ordering: (a) checking of the order and verification by means of the duplicate copy of the order sheet that the right document has been received; (b) checking of the document's condition; (c) acknowledgement of receipt or complaint and return in case of a mistake or if the document is in poor condition; (d) filing of completed orders in the 'orders received' files; (e) dispatch or checking of invoices and payments; (f) formal acknowledgement of donations and exchanges, with proof of posting.

The operations related to the document itself are: (a) sorting out the documents for storing from those for immediate consultation (notices of meetings, memos, programmes) to be disposed of after use; (b) registration of the document in an 'accessions register' numbered from one onwards; each document should be given a number (an entry, accession or inventory number) which is noted in this register together with succinct bibliographic data and the date of acquisition; all these registers together constitute the stocklist of the collections and it is the accessions register that must be saved in case of fire or some other disaster; periodicals are registered twice, in the accessions register where each series is given a single number once and for all and a second time in a special file of the Kardex type where the arrival of each new issue of a particular periodical is noted on cards; this operation of checking the issues received shows the state of the collection and makes it possible to complain or renew the subscription in time; (c) stamping: the name and address of the owner organization is stamped in the document, always in the same place, usually the title page and a page of the text; (d) protective measures: where necessary, strengthening of the cover, binding, anti-theft magnetic marking, etc.,

1. See Chapter 5 for an explanation of these terms and Appendices 3 and 4 to Chapter 18.

(e) preparation for loan: establishment of a loan card, preparation for loan by attaching a strong card-holder to the cover to contain the loan card, and insertion of the loan card.

After intellectual processing (see Chapters 5 and 6), these operations are completed by registration of the call number, entries in the files and so on. The call number, if not based on the subject as defined in the classification procedure but on size, source or type of document and accession number, may be fixed during the manual operations of entry and immediately marked on the cover or spine of the document.

Check questionnaire

What is the meaning of the term 'acquisition policy'?

How can non-conventional literature be traced?

What are the different modes of acquisition?

What is 'shared acquisition'?

What is legal deposit?

What are the various possible types of acquisition?

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4 The storage of documents

Storage is the operation whereby documents are arranged in the best possible conditions for their preservation and utilization. A collection of documents is a financial and intellectual investment for information, teaching, study and production; it is essential to the development and dissemination of knowledge and a valuable national asset. It must therefore be kept in good condition. Any document that is destroyed or damaged represents the loss—sometimes irretrievable—of a piece of knowledge, and any document that is mis-shelved may be considered as lost.

Storage involves decisions on the form of storage, the filing system to be employed, the amount of available space and equipment, and the requisite conditions for satisfactory conservation.

Forms of storage

There are two basic forms of storage, since documents can be conserved (a) in their original form, and (b) in reduced form or microform, by microcopying on microcards, microfilm or microfiches. The entire document is reproduced on a minute scale, thus saving considerable space and weight, but the technique requires special reading and reproduction devices. This method of conservation is gaining ground, especially for collections of newspapers, maps and archive material. At present it is still reserved for the large centres, but it will undoubtedly spread in the years to come. It calls for suitable climatic conditions and the correct equipment, as microforms are particularly fragile.

Filing

Filing consists in arranging the documents in a predetermined order so that they can be easily and rapidly retrieved when requested. The proper use of collections

depends on a good filing system, which should be easy and quick to use, assign each document to one and only one place, which never changes, be capable of expansion, allow the detection of shelving errors, and ensure the satisfactory conservation of documents.

There are three methods of shelving: horizontal, upright and vertical.

Horizontal filing, in which the documents are laid one on top of the other, is used for files and large documents such as maps, posters, technical drawings, photographs and newspapers. It needs special cupboards.

In upright filing the documents are placed end up and side by side. This method is used for books, archives, boxes, folders, sound records, etc. Tape-reels may be arranged upright or flat.

In vertical filing the documents are arranged with the spine down one behind the special folders. It is usually employed for light and thin documents which are constantly being referred to (correspondence, press-cuttings, etc.). Hanging folders are a special form of this type.

The choice of filing system depends on the nature of the document, how often it is consulted, user needs and available space and equipment. It is preferable to refrain from acquiring certain documents if the necessary storage and conservation facilities are wanting rather than to have them pointlessly damaged.

There are two types of filing: numerical and systematic filing.

In numerical filing, the documents are arranged in order of acquisition, by their accession number (see Chapter 3). The advantages are simplicity, infinite extensibility and the saving of space. The main drawback is that subjects and authors are scattered and one has to look through the author and/or subject catalogue to locate a document or find out what the information unit has on a particular subject.

In systematic filing, the documents are arranged according to their contents and in conformity with a predetermined classification (see Chapter 8). Within each class, the documents are usually placed in alphabetical order. This method has the advantage of grouping documents on a particular subject—more satisfactory from the user's point of view—and facilitating direct access to the shelves. But it can be hard to determine the central theme of a work, with the consequent risk of a loss of information. Secondly, space is not used efficiently and the whole collection has to be rearranged if the classification changes.

It is essential to attribute a call number whatever filing system is chosen. The call number is a set of symbols (letters, signs, figures) which indicate where the document is stored.

In numerical systems, the call number consists of the accession and registration number. When documents are classified by subject, it becomes the notation of the classification heading under which it is shelved. This is usually a series of figures followed by the first three letters of the author's name. The call number must be marked without fail on all the cards that mention the document and, when there is one, in the accessions register. It is the only means of finding immediately the document's assigned location.

Stock-taking

Stock-taking is an operation which involves verifying where the documents are, identifying missing documents (lost or on loan) and checking the condition of collections. It must be carried out each year. Depending on the system of classification, it is based either on the accessions register or on the shelf-list (a catalogue in which the cards are arranged in order of call number, i.e. in shelf order; see Chapter 11).

Satisfactory stock-taking requires all loans and consultation to be temporarily suspended and preferably the closing of the information unit for the length of time needed.

The choice of filing system will be influenced by **frequency of utilization**, which in turn will depend on the nature and age of the document and on user needs. Each information unit should be as familiar with these variables as possible and adjust its filing system accordingly, allowing for the amount of space available and the unit's objectives. The first question to settle is whether users should be allowed direct access to the shelves. Provided there is enough room, direct access makes for more flexible utilization and facilitates systematic searches and browsing. On the other hand, it complicates control, increases the risk of disorderly shelves and calls for a shelving arrangement that users can easily understand.

Older documents are usually consulted less and less often as time goes by. Periodicals, for instance, are much in demand for a year or two but hardly at all after five years. They may therefore be shelved in less accessible spots or in the storage area or even withdrawn altogether if conveniently obtainable from other nearby units. Models based on statistical studies have been developed to facilitate rational decisions on the filing and withdrawal of the various documents in the different types of information units. Conversely, documents in heavy demand should be available at once and in enough copies.

Causes of deterioration

Documents can deteriorate in many ways and the necessary preventive and protective measures should be foreseen before the information unit is built or comes into operation. Damage can be occasioned by physical, chemical, vegetable, animal or human agents.

The physical agents of deterioration are as follows:

Time renders documents increasingly fragile, more and more yellow and with fading colours. Ancient and precious documents should be handled as little as possible.

Variations in climate make air-conditioning necessary for units in hot countries, not only for the comfort of users but to keep certain delicate machines in good running order. It is essential for films, magnetic recordings and for the rooms where computers are installed.

Humidity and moisture are bad for documents. The degree of humidity (or proportion of water vapour in the air) should remain constant at around 40 to 45 per cent. There exist appliances for this purpose. An excessively dry atmosphere is also to be avoided. Water damages some documents even more seriously than fire and care must be taken to avoid, as far as possible, installing water pipes in storage areas.

Inadequate ventilation allows dust to build up and attack the materials. Special precautions should be taken, but with care to avoid draughts.

Too much light tires the user and yellows and destroys certain materials. Arrangements should be made for special glass and window-blinds, especially in countries with a lot of sun.

Magnetic disturbances may harm documents on a magnetic carrier by wiping out the recorded material. Such documents should not be placed near a magnetic field (such as an electric motor) and machines should not be allowed to run backwards.

Chemical agents are equally harmful. Paper is seriously damaged by the acidity of the cellulose with which it is made and, when increased by atmospheric pollution, this is one of the main causes of deterioration where paper is concerned. As for audio-visual documents, they suffer from the basic instability of the materials used. The effect of pollution may be diminished by careful storage in appropriate containers.

Vegetable agents include mildew and fungi, caused by too much humidity. Documents may be protected by preventive or curative measures (fungicides, for example).

Animal agents are paper parasites such as woodworm and rodents, which can now be very effectively controlled by chemical means. It is essential for the premises to be kept spotlessly clean.

Human agents may also be responsible for damaging a collection. Normal wear and tear from handling and circulating documents may be reduced by binding or boxing them. The condition of reproduction facilities and audio-visual reading devices should be checked regularly and they should be protected as far as possible from dust or bumps. Rare and costly documents should not be allowed out but kept for consultation on the spot. In some cases, the examination of very precious documents should be restricted and authorized only for those whose work makes it indispensable.

Material damage, such as staining ('foxed' documents), scratches on photographs and records, tears, torn-out pages and handwritten comments or marks, is unfortunately hard to avoid when the information unit is open to many users. Attempts must be made to make each reader realize the importance of keeping documents in good condition for his own sake and for that of other people.

If a document is lost, the cost of a new copy, or of a replacement if it is out of print, should be demanded.

Theft can be prevented—or at least reduced—by a number of measures. The room should be laid out in such manner that readers have to pass in front of a

member of the staff on the way in and on the way out, and they can be required to leave bags and briefcases at the entrance or present them for inspection on their way out. There exist magnetic warning devices which, using a hidden pellet, emit a sound as they pass in front of a machine located by the door. When a reader borrows a book in the normal way, the pellet is desensitized. Rare and precious documents should be withdrawn from the reading-room and made obtainable only when requested by an identifiable person. Lastly, there should be as few hidden corners and badly lit areas as possible.

As a rule, original documents are copied when they are rare, sometimes unique specimens, difficult or impossible to replace. Records, films and audio tapes allowed out on a loan should be checked regularly. Audio-visual documents should be systematically reproduced to build up a collection that will serve as a security stock. In some cases, the user may be asked to pay a deposit so as to encourage him to take good care of the documents and return them on time. Good relations with users, special training in information activities and the courteous but sustained and firm vigilance of the staff will cut down some causes of harm. However, a certain amount of deterioration is inevitable and should be assessed and allowed for in the administration of the unit. Fear of seeing collections deteriorate should never hinder the use of documents, which is after all the main purpose of the information unit.

Restricted documents may be included in the collections and require protection—separate filing, special card catalogues if necessary, keys in the case of computer files—to ensure that only authorized persons have access. It should be regularly checked that the documents are still judicially restricted; if not, they should be transferred to the general collection.

Certain freely available documents, however, are subject to special conditions (e.g. copyright, an individual's rights over photographs of himself, etc.). Users should be informed of these conditions and care should be taken to see that they are respected.

Repair and restoration

Repair and restoration are not to be improvised, as they call for special techniques and specific methods. Mistakes here can cause irretrievable damage.

Almost all damage can be repaired, including documents which have been burned or soaked in water, stained microfilms, etc. Before deciding what to do, the damaged document must be carefully examined as to the nature of the material, the extent of the damage, the degree of acidity, and the page numbering and sequence.

Depending on its condition, one then proceeds to strengthen, clean, wash, flatten or re-glue it. This is the first stage in restoring a paper document. A more seriously damaged document will have to undergo special treatment to neutralize acidity and restore its condition, using techniques such as gluing (with paper or silk gauge), or lamination (reinforcing a page by sealing in a hot press).

Lastly, binding will renovate a damaged book or make a book that has to be frequently handled last longer. There also exist transparent, flexible and highly practical plastic covers or jackets for thin documents or even books.

Restoration techniques require skilled workmen and special tools. The restoration of archives material obeys strict rules designed to prevent forgery.

Check questionnaire

What is meant by the term 'storage'?

Can documents be conserved in other than their original form? How? Why?

What is a call number?

What are the qualities of good filing?

What is the main enemy of paper?

How can a storage area for documents be kept under proper surveillance?

Can a damaged document be repaired? How?

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5 Bibliographic description

Bibliographic description is both an operation and a product. When regarded as a product, it is also known as a bibliographic record or bibliographic reference and consists of a conventional set of data based on an examination of the document for the purpose of providing a unique and accurate description of it as a physical carrier of information.

Viewed as an operation (also known as cataloguing) it represents the first stage of a document's intellectual processing during which these data are identified, defined and recorded in accordance with strict rules.

In most cases, the bibliographic description of a document begins after it has entered the information unit and gone through the reception and registration procedures.

Sometimes, however, the bibliographic record is worked out and printed with the primary document, usually on the front end-paper; this is called cataloguing in publication and it greatly simplifies, or even renders unnecessary, the corresponding task of information units.

It is becoming more and more common for cataloguing to be carried out by a national centre such as the national library ('centralized cataloguing') or shared between several information units ('co-operative cataloguing'). The information units received from the centre or from their fellow-units the bibliographic records corresponding to the books they have acquired and thus do not need to carry out the work themselves.

Purpose and procedures

The purpose of bibliographic description is to provide the document with a unique, non-ambiguous reference so that it can be subsequently identified, located and entered into the various card files and catalogues, and then retrieved or another copy ordered (see Chapter 11). As a rule, a bibliographic description should be distinguished from a bibliographic record: the former constitutes the set of data needed to describe a document whereas the latter is a fixed subset of these data, i.e.

not necessarily all of them presented in standard fashion on a special form which is designed for consultation by the user in the manual card files or computer files of an information system.

The data fields covered by bibliographic description are subsets of bibliographic data each of which provides a particular piece of information, i.e. each data element describes one aspect of the document. The data fields are ordered in a logical sequence, but vary a little according to the type of document, particularly in the case of monographs and serials. The description of nontextual documents raises special problems but follows the same basic pattern of fields and deals with the same type of data.

Certain data fields are mandatory and always included in the records, although the order may change slightly from one system or one type of document to another. Others are optional. Each field can contain a single data element or several related data elements which in turn may be mandatory or optional.

For textual documents, about fifty of these data fields have been defined. Though we shall examine the content of the main fields later (see the example given at the end of this chapter), the ISBD,¹ for instance, requires the bibliographic records of monographs and serials to cover the following fields:

Monographs

Title and author
Edition
Bibliographic address
Publisher's name, location
and imprint
Collation
Collection
Notes
ISBN,² cover and price

Serials

Title and author
Edition
Number
Bibliographic address
Publisher's name and location
Collation
Collection
Notes
ISSN,³ key title and price

A document's bibliographic record may be supplemented by other data added after contents description stage (see Chapters 6 to 10), such as classification numbers and/or an index of the contents and, where necessary, an abstract. Multiple author entries, for the principal and associated authors, may be needed for the card indexes. Generally speaking, the bibliographic record is employed in the documentation system or by the user as a substitute for the primary document. Since it takes the place of the primary document in a good part of the documentary chain—which is why it is commonly called a surrogate document—it must be as accurate and precise as possible and provide the user with all the information he needs to select or acquire the primary document.

1. International Standard Bibliographic Description.

2. International Standard Book Number.

3. International Standard Serials Number.

Bibliographic description involves the following procedures:

Acquaintance with the document.

Determination of the type of document and of the rules applicable in its case.

Determination of the appropriate bibliographic level for processing.

Identification for each bibliographic level of the necessary bibliographic data, in the order of data fields set by the standard or format employed.

Transcription of these data according to the rules fixed by the standard or format.

Checking of the description's accuracy and conformity with the standards.

Transmission of the record for final or further processing.

Since the purpose is only to record factual data which can normally be found by a simple glance at the document, it might be regarded as a perfectly straightforward operation. This is not so. However perfect the standards, formats and operation manuals, a document can seldom be described without at least some thought, and many documents can quite legitimately occasion different interpretations or represent borderline cases (for example, a communication to a congress published separately in a periodical).

A useful habit is to make a systematic note of all decisions taken so that the standards and manuals can be backed up by a code of practice or additional explanations.

In computerized systems, the job is generally performed in two stages: an input sheet is received which is subsequently transferred to a machine-readable carrier. At the same time direct entries are started, that is the computer is fed with the various elements of the description, each preceded by an identification mark; the record is gradually built up and then checked, in part by the computer itself.

The bibliographical data are drawn mostly from the document itself and, if some are missing, from external sources too. The title page is particularly important since it generally provides most of the elements needed for bibliographic description. Titles and authors should always be taken from the title page, not from the cover, which is often incomplete.

The rest of the work—in particular the table of contents, list of illustrations, etc.—may be used to fill out and give more precision to the data obtained from the title page (e.g. number of pages, illustrations, etc.). When certain data are entirely omitted, an attempt can be made to find them from external sources: the date of publication, the real name of the author or the price, for example, may be discovered in bibliographies, publisher's catalogues and announcements, directories, etc. All doubtful data are left out.

Standards and formats

Standards and formats are fundamental to bibliographic description since bibliographic records provide the only means of identifying the documents themselves and acceding to the information they contain.

The need for easy and universal access to bibliographic information and the development of co-operation between information units soon resulted in standardization. This was at first introduced at the national level or for a particular language. In many countries, standards and rules for cataloguing were worked out and maintained by professional committees. In view of the spread of English, the *Anglo-American Cataloging Rules (AACR)* became very important and have even been adapted for Spanish.

The use of computers made standardization more necessary than ever, particularly since the records, in order to be read by the machine, had to obey strict intellectual rules but also follow an extremely precise and uniform presentation using conventional characters and a fixed length. These rules and their material presentation constitute a format.

Under the aegis of the International Federation of Library Associations and Institutions (IFLA), efforts to work out international standards have resulted in the International Standard Bibliographic Description (ISBD), which was first applied to monographs (ISBD-M). The scheme for serials (ISBD-S) is in the process of being adopted. Standards for audio-visual documents (ISBD-NBM), maps and technical drawings (ISBD-CM) and sheet music (ISBD-Music) are under study.¹

The various ISBDs are carefully defined sets of rules for the presentation of bibliographic data together with punctuation marks to help identify them. Once in force, these standard rules should facilitate Universal Bibliographic Control (UBC), that is a uniform method of description for all bodies responsible for producing national bibliographies of the documents published in each country that can be used by everyone.

At the same time, a UNISIST and ICSU-AB Working Group (see Chapter 18) has prepared a *Reference Manual for Machine-readable Bibliographic Descriptions* which proposes model guidelines for bibliographic records and exchange formats. The recommended bibliographic record covers three bibliographic levels—the monograph, the collection and analysis (see below)—which makes it usable by all documentation centres and secondary services which break down documentary units into greater detail than the national bibliographies (for example, chapters in books, articles in a periodical, papers included in the proceedings of a congress, etc). The standardization of formats is in preparation: the efforts here are centred on the format employed by the United States Library of Congress, MARC (machine-readable catalogue), which sets the pattern for many bibliographic formats used by libraries, largely because of the great number of records available in this format (MARC-BNB, INTERMARC, MARCAL). Many other formats have been devised for documentation systems and secondary services. However, since the requirements of the computer systems for which they have been designed vary, standardization is less concerned with producing a single format than with ensuring compatibility, i.e. the possibility of switching automatically from one format to

1. See the Appendices 3 and 4 on ISDS and ISBN at the end of Chapter 18.

another. This can be done by harmonizing the contents and structure of the data fields so that they can each be identified without ambiguity (by using conventional signs to indicate the contents of the field and the beginning and end of fields and sub-fields).

Contents of bibliographical records

Bibliographic records are generally identified by a code indicating the originating information unit and year of production, and a serial number. This number is usually attributed in chronological order but the international co-ordinator may allocate blocks of numbers to each unit participating in a network.

The identification may also include conventional signs to show that the record is new, replaces another, forms part of a set of records describing a single document or is linked to some other record (translation, new edition, etc.).

In most cases, this information is noted in the headings of catalogues since these are mainly for purposes of control and processing.

The final identification number is always entered in the records as it provides the main link between the record and other documentary products and services (index, requests for copies, etc.).

The indicators of literature type show which category of document recognized by the information system is involved. As each type of document has to be processed in the appropriate manner, these indicators serve to check the accuracy of the record. It will be known, for instance, that the record of a thesis must include certain data fields such as title, author, date, language, collation, university and accessibility, and their presence is checked for each record by means of the special thesis indicator. The indicator may also be used for statistical controls. In normal circumstances, the systems do not list all possible types of documents but give codes to a certain categories (six for the UNISIST/ICSU-AB manual and ten for AGRIS, for example), it being understood that any document will fall into one of them. The important thing is to show the special processing which a document has to go through. Certain systems also use bibliographic indicators in the same way as indicators of literature type. Their function is to signal the presence in the document of certain data elements that could be useful but which are not processed separately: for example, maps, numerical data, glossary, abstract or bibliography.

Such elements (e.g. the number of references or the period covered by the bibliography) are then specified in an appropriate field, usually a notes field. In most systems, these indicators are placed in the header of the record.

The indicators of bibliographic level show what part of the document is described in the record.

A book may, for instance, contain several chapters each of which forms a separate entity. Clearly, the book must be described as a whole since it is the only physical carrier of the information, but it may also be worthwhile to describe certain chapters—if not all—as intellectual entities called 'documentary units'.

The same goes for a periodical and its articles, for congress proceedings and the individual papers presented, etc. Secondly, certain documents may exist in separate physical entities yet form part of a larger whole which possesses its own coherence from both a material and intellectual point of view: for example, the successive volumes of a treatise, the various parts of a technical report, a periodical. A distinction is therefore made between three bibliographic levels, which in order of decreasing specificity, are as follows:

The analytical level, in which the record deals with part of a given document such as a map in an atlas, an article in a periodical or a chapter in a book.

The monographic level, in which the record deals with a single document such as a book, atlas, standard or patent.

The collective level, in which the record covers a particular set of documents, such as a book in several volumes or a periodical.

The analytical level, of course, cannot be used on its own except in special circumstances, such as when the document from which the documentary unit to be described has been taken is not available. Normally, records at the analytical level should be accompanied by records at the monographic or collective levels. They will however contain all the necessary elements for identifying the source document.

The author is the person or persons who have created the document, that is written the book or article, taken the photograph, made the film, presented the communication, made the invention or registered the patent, drawn the map or illustration, designed the computer program and so forth. The document bears his name. The author may be: (a) an individual, or natural author; (b) an organization or corporate body, i. e. a corporate author; or (c) a non-identified author, i. e. an anonymous document.

If there are several authors, the corresponding data field is repeated. If the author is not identified the field is omitted or 'Anon' for anonymous (in accordance with certain long-standing rules) is written.

In the case of natural authors, a key name is selected, usually his family name, together with further details if required (e.g. whether Mr, Mrs or Miss if the first name does not indicate the sex, or suffixes such as 'Jr' or 'II'). This is called the author entry (or main entry) and is the first data element of the record. The family name is followed by the first name, in full or as initials, so as to distinguish between persons with the same name. There are international or special rules for presenting particles, suffixes or titles in an understandable and invariable form, and for transcribing names from non-Roman scripts. When the name on the document is a pseudonym, an attempt must always be made to discover and add the real name. The same goes for previous and later names if there has been a change. The problem is to pin-point the author of the document described by the record and to be able to recognize him or her as the author of other documents. There must be no room for ambiguity: for example, if one record mentions a single first name while another has two for the same author, the user will think that the two documents are by different authors.

Certain systems insist on indicating the organization to which the author is

affiliated since this will point to an information source. This information is given in the author field after the key name or in a special field later.

When there is more than one author, the usual procedure is to mention only the main ones or the first three cited. Nevertheless, some systems make it a rule to mention all the authors in order to identify the document and at the same time signal as many information sources as possible.

Another possibility is that the document contains an introduction, preface, foreword or postface the author of which it is important to mention. For this, a special field or a notes field is used. The same applies to an illustrator.

The editor is the person responsible for a publication that groups together the contributions of several authors, with or without one from himself. Such publications are therefore collective works: collections of papers, conference proceedings and so forth. The record will state that it was published 'under the direction of X' or that X is the 'editor', or preferably 'scientific editor', or 'responsible for publication' or 'main author'. The document usually bears his name, with a special mention '(ed.)' either after the author's key name in a special field or in the edition field. When the person responsible for the publication has a special kind of relationship with the work—he may be the translator or the compiler of a bibliography or terminological work—one puts 'trans.' or 'comp.'. In French, the term '*éditeur*' can also designate the individual or corporate body who simply publishes the document having usually had no hand in its actual contents. In all cases, care must be taken to distinguish accurately between an author and an editor.

Authors of theses and/or academic works require further information. It often happens in fact that they do not belong to any institution at the time the research in question is submitted or are affiliated to a different institution of higher education from the one to which they submit it. In certain cases, however, the scientific research behind the publication was carried out in the latter institution which therefore becomes an information source for the specialist field concerned. In most cases, moreover, it is the only place where the primary document can be obtained. Finally, the reputation of the institution will give an idea of the document's value. It is therefore very useful and often mandatory in bibliographic-description systems to state the name and address of the institution of higher education to which the thesis was submitted. A field is reserved for this purpose. The nature of the work should be stated in the appropriate field, a degree thesis and a Ph.D. thesis being different in content as well as in academic importance.

There arises a similar problem when the research described in the document was carried out in or by an organization different from the corporate author or from the body to which the natural author is affiliated. This organization will be a source of information for the subject area concerned and possibly the place where the primary document can be found. Its name and, if possible, address should be noted in the appropriate field.

The corporate author is an organization with intellectual responsibility for a document and may be: (a) a private body such as a company, association or political party; (b) a public body with or without independent legal status, such as

a ministry or university; (c) a territorial entity such as a state, province or municipality; (d) an international organization such as the World Meteorological Organization or the Organization of African Unity.

Sometimes, the name of the corporate author mentioned on the document stands for that organization as a whole (for example, Ministry of Planning, National University) but it is more common for the corporate author to be a particular unit within the organization. To avoid ambiguity one should state—if mentioned on the document or known from other sources—the title of the main organization followed by that of the unit responsible (for example, Ministry of Planning, Department of Industrial Studies, Statistical Unit or National University, Faculty of Agriculture, Laboratory of Pedology). Only the hierarchical levels needed to identify the unit without ambiguity should be entered.

Where territorial entities are concerned, care must be taken to distinguish between those bearing the same name (for example, the town of Sfax and the Governorate of Sfax) and to mention the region, country, province to which they belong. The name chosen will be the one on the document, but spelt out in full since acronyms and abbreviations are a potential source of confusion. If need be, the acronym is added after the name; certain universally employed acronyms, however, such as Unesco, FAO or IBM may be utilized. The terms indicating the type of organization—for example, University (Univ.) or Aktiengesellschaft (A. G.)—may be abbreviated in accordance with the system's rules except when they form the first word of the name. Unfortunately, the names of corporate bodies are not always mentioned in the same form. To counter this, documentation systems establish and maintain authority lists that state the form of the name to be used for all corporate authors whose documents have been entered into the system. These lists also indicate any admissible abbreviations.

For satisfactory identification, one should also name the country in which the corporate author is located and if possible its address. Clarity can be improved by putting the name in its original language as well as in the working language of the system.

If there are several corporate authors, they must all be mentioned.

It is common for corporate authors to double as publishers: in this case they must be mentioned in the author field and in the publisher field.

The title is a name, a phrase or a series of phrases indicating the subject of a document (monograph, patent, article in a periodical, film, etc.), designating a collection or a serial, or stating the nature and purpose of a meeting. The title may take various forms:

A single title: for example, *Desertification*, or *The Role of Savings in the Modernization of the Rural Sector*.

A main title and subsidiary titles, such as subtitles or additions: for example, *Desertification: Recent Trends and Preventive Measures*, or *Desertification (General Situation and Outlook after the Conference of Nairobi)*.

Consecutive titles, i.e. more than one title, such as: *The Family Garden. The Kitchen Garden*.

Alternate titles: for example, *The Ideologies of the Third World or the Search for a Third Way*.

Translated titles: e.g. *Population Growth and Urbanization (Croissance démographique et urbanisation)*.

Parallel titles: i.e. the same titles in several language: such as: *Uhuruni mwanzo—Freedom and After—La liberté et après*.

The full original title is used, together with subtitles and other possible additions. In the case of parallel titles, it is the first one mentioned that is used.

Depending on the system, the original title may be entered and a translation added whether mentioned on the document or produced for the occasion. Alternatively, original titles are systematically translated into the system's working language and entered in a special field, with the original title then called the 'primary title'.

The title of a meeting is mentioned when the document is made up or drawn from its proceedings. It can be noted in the title field if the fact is clear from the title of the document, or in a special field. This is done by giving the full title of the conference as provided by the document, including its number if necessary (e.g. Seventh Conference on . . . etc.), and the type of meeting (International Conference, Congress, Inter-state Committee Meeting, etc.). Translation may be made as before. The venue and date, which are essential for identifying meetings, are entered in the adjacent field. This procedure provides certain pointers as to the value of the document and makes it possible to group together all the documents related to a meeting.

For serials, an 'abbreviated title' is used, not always a shortened version of the original title but a conventional expression registered in the International Serials Data System (ISDS) and in the ISO's list of abbreviated titles. Such abbreviations are widely employed since many titles of periodicals are long. The authority list serves to express them in standard and invariable form. Occasionally—and even quite often—periodicals change their titles, thus complicating bibliographic description, which then indicates the new title in the title field and the former title in a special field or in a notes field so that a collective card can be made out if necessary.

Subtitles and additions can also be mentioned. The titles of collections are treated in the same way as those of monographs,

Edition provides information on the documentary product concerned in cases where the same document has been published several times or in different forms (for example, third edition, revised and expanded edition by . . . , illustrated edition, full edition, etc.)

Data of a similar type are used to indicate chronological series, volume number, part number, certain details regarding issues of serial publications, such as special issue, etc., or, for monograph records, the title of the collection. This information is noted in special fields.

The bibliographic address includes practical information on the production of the document: place of publication, name of publisher, imprint (date of publica-

tion or printing). The place of printing and the name of the printer may also be mentioned if the place of publication and publisher's name are not given. These details are noted in one or several successive fields, depending on the system. The publisher's name and address, or at least the name of the town or city, are usually to be found on the document but the name of the country might have to be added to avoid all risk of confusion. The place of publication is the town or city in which the publisher is based, the latter being the organization, or person, responsible for the production and distribution of the document, as distinct from the printer who manufactures it on the publisher's behalf, though the two functions may be performed by the same organization. When the publisher's name or the place of publication is omitted, 'n.p.' (no place) or 'n.n.' (no name) is put in its place; when several publishers have joined forces to produce the document, the relevant data field or sub-field is repeated. Similarly, where a publisher has branches in different countries (e.g. Mouton, in Paris and The Hague), this is noted. This procedure increases the chances of obtaining the primary document. The date of printing or publication—at least the year and sometimes the season—is normally indicated on the document but, if missing, may possibly be deduced from the copyright mention (invariably dated), the date of legal deposit, the printer's imprint or other details such as dated preface. The date is essential for retrieving and characterizing a document; if unobtainable, 'n.d.' (no date) is written. Some systems allow an assumed date, with explanatory notes in the notes fields.

For an article or the issue of a serial, the title is followed by the volume, year and number.

Collation provides a physical description of the document: (a) its division into volumes or parts; (b) its size in centimetres; (c) pagination (number of pages, for each part if necessary); (d) illustrations: presence, number and nature (drawings, photographs, tables, etc.); (e) bibliography: presence and possibly the number of references and type of bibliography (especially if with comments); (f) index.

Special numbers and codes have been worked out for the accurate identification of documents, though they do not yet cover all categories. They are mentioned on the document.

For books, an 'International Standard Book Number' (ISBN) is attributed to each book in accordance with a system designed to promote international co-ordination. This number is made up of ten digits in four sets, the first three of which are of variable length. It serves to identify: (a) the group (the group indicator); (b) the publisher (the publisher indicator); and (c) the title (the title indicator). A control indicator is added at the end.

For example, in ISBN 02-7081-324-5, 02 represents the French language group of publishers; 7081 a particular publisher; 324 the book by G. Van Slype, *Conception et gestion des systèmes documentaires*, and 5 the control character.

For periodicals there is an 'International Standard Serial Number' (ISSN), attributed once and for all, as part of an 'International Serials Data System' (ISDS), to each periodical title by a national, regional or international agency. Each agency allocated a group of ISSNs and gives each periodical title a number

containing eight digits in two groups of four separated by a hyphen, with the last digit a control character.

For example, ISSN 0002-8231 identifies the *Journal of the American Society for Information Science*.

Before the ISDS was set up, the American Society for Testing and Materials has developed a coding system for periodical titles alone which, known as CODEN, now covers over 100,000 titles. It is composed of six characters, five letters and a control digit. For example: CODEN AISJB6 refers to the *Journal of the American Society for Information Science*. The CODEN will probably be superseded by the ISSN, but at present it can be used along with the ISSN, or if there is no ISSN.

Patents documents are identified by means of international code (ICIREPAT) which employs an alphabetical or alphanumeric system to show the nature of the patent, together with a number, usually chronological. For example, 'A' signifies a patent number in a primary series at the first publication level and 'USA A 3607127' designates the United States Patent No. 3 607 127.

Most organizations which regularly publish reports give them alphanumeric codes made up of several digits to identify the responsible unit, the programme and the report (numbered chronologically). For example, in FAO-SIDA-TF-IND-92, the first two elements indicate the responsible bodies, the next two the programme and the last one the number of the report. Though this information can only be interpreted by someone who knows the code in question, the code itself at least enables a person to identify the report with precision.

Many other documents also bear numbers or codes for precise identification: laws, decrees, standards, maps, specifications for items of equipments, public contracts and subsidies, etc. These numbers are very useful since they provide a relatively simple means of avoiding ambiguity in identification or recording. They simplify all operations to do with acquisition, sale, administration, sorting, loan and exchange, and provide the basis for cataloguing.

Certain documents such as patents or reports include additional numbers and codes which refer to related documents or to series; these can be noted in a field for secondary numbers.

The language or languages of the text and abstract (or abstracts) can be marked in a special field for this purpose. Notes can be included in the bibliographic description as necessary to clarify any aspect of a document or any element of the description which the other data fields might not make sufficiently explicit or which deserve special attention.

Certain systems provide fields for special data such as comments on a document's availability or value or the fact that it exists only as an abstract.

Bibliographic description at the analytical level is necessary each time a physically discrete part of a primary document is of special interest for the users of an information unit. The work of identifying and cataloguing these documentary units is known as 'analysis'. They may be distinct separate entities—like an article in a periodical—or items such as a table or a map taken from the body of a document. The record should describe such a unit accurately and pin-point its exact location in

the primary document from which it comes, in other words make out what in practice amounts to a double entry.

Cataloguing patents raises a number of special problems. In most countries they give rise to several successive documents and can occasion different kinds of publication reflecting a series of decisions (reception, authorization to communicate, scrutiny, award of various types of protection), each with a special legal standing. These documents follow a specific pattern: title, sector of the technique, previous status of the technique, purpose, means utilized, illustrative application, claims, examples and practical diagrams showing how it is carried out. They are all interrelated, since a patent may be an addition to, or a subdivision, continuation or reissue of, other patents. A number of individuals or corporate bodies may be involved in the production or submission of a patent, including the applicant, inventor, grantee of the deed of protection, attorney or agent, and the assignee.

The date of application and the date of publication are of vital importance since they mark the start of legal protection for the invention. Under the aegis of the World Intellectual Property Organization (WIPO) and the Committee of the Paris Union for International Co-operation on Information Retrieval among Patents Offices (ICIREPAT), an international code for bibliographic description (INID-ICIREPAT numbers for the identification of data) and an international classification of patents have been developed.

Maps and technical drawings are difficult to catalogue because of their particular nature and the lack of a standard international code, still under consideration.

Maps bear a title, although there are unfortunately many exceptions. But the title is often incomplete or unhelpful, so that it has to be reconstructed from information in various places (tablets, legends, notes, etc.) or by examining the document. The name of the territory concerned must also be mentioned if omitted from the original title. The author, more often a corporate body than an individual, is seldom mentioned.

The scale, or ratio between the representation of distances on the map and real distances (e.g. 1:5,000), is an essential piece of information for all maps or plans. It is needed in order to use the document but also to gauge the amount of detail given and hence the document's suitability for a particular purpose.

As for the bibliographic address, the same data elements are employed as for other documents: place and date of publication and publisher's name. The date entered is that of the map's publication rather than that of the field surveys on which it was based, though it is frequently useful to mention the latter in the notes. Collation should indicate, as the case may be, the number of sheets, the material used if not paper, the graphic process employed, the colours if not black and white, and the overall size. The notes field is used to signal the inclusion of insets or cross-sections—which should be fully described—and, when relevant, the collection. It goes without saying that, if the map or chart is drawn from another primary document, the latter's bibliographic reference must be marked in the appropriate field.

Bibliographic description of audio-visual documents

This description gives rise to few major difficulties. These documents do not always have the equivalent of a title page, with the result that the necessary data must be sought on the document itself, its packing or accompanying documents. For photographs one is often forced to invent a title.

The next problem is that of defining the document as a unit, particularly for photographs (Is it the photograph or the series of photographs, i.e. all photographs on the same subject?), and of determining the documentary units, particularly where films are concerned (Should it be a shot, a sequence or a theme?). The author is not always stated. Apart from photographs, most audio-visual productions are collective works. With films, the director is regarded as the main author, with recorded classical music it is the composer, in the case of a song, the singer. Some audio-visual documents such as still pictures or sound records are brought out by publishing houses but a great many of them are unique specimens often existing in several versions with different physical characteristics.

In consequence, the full address of the publisher or producer should be stated in the address field since they are often little-known individuals or corporate bodies hard to locate. The distributor or agent is then added because they often differ from the producer or publisher.

Another vital point is to state the physical characteristics of the carrier, since they determine how the document can be used, in particular the type of device needed to read it. The collation field therefore has to incorporate much information: in the case of a film, for example, it should indicate the type of carrier (positive or negative), the number of reels, boxes, tapes or cassettes, the projection time, the length and size (in millimetres or inches), the image process, sound process, colour process, projection speed and any written documents that go with it (the script, for instance).

The notes field can be used for adding any useful details which cannot be included in other fields, such as the circumstances in which it was produced or presented, points about the presentation of the contents, technical consideration whether it is the original or a copy.

Check questionnaire

What is bibliographic description?

What is the purpose of bibliographic description?

What is the meaning of the term 'data field'?

What is a corporate author?

What do the terms ISBD, ISBN, ISSN and CODEN mean?

What is their purpose?

Where can one find the data needed to describe a document?

What are the particular problems raised by the bibliographic description of audio-visual documents?

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(See also the bibliography of Chapter 11, in particular the rules for cataloguing.)

Appendix. Example of an input sheet showing data fields

NARRATIONS series		Type 500	/W	Dest. 652	5	N° bord. 653	V
# R	Pays 504	660	7	Origine 651	8	9	
SUR-ENSEMBLE	220	+ K					
Titre traduit ou construit	^/1						
Organe command.	130	B	/1				
Auteur pers. phys.	110	W					
Autre Aut. pers. phys.	111	J					F
Auteur pers. mor.	120	+ O	/1				
Autre Aut. pers. mor.	121	+ R	/1				G
ENSEMBLE	221	G					
Titre traduit ou construit	^/1						
titre congrès	230	+ J					
Organe command.	130	B	330	/C	511	+ N	
Auteur pers. phys.	110	S	/1				
Autre Aut. pers. phys.	111	J					F
Auteur pers. mor.	120	+ O	/1				
Autre Aut. pers. mor.	121	+ R	/1				G

6 Contents description

Contents description (CD), so called to draw a parallel with bibliographic description (BD), covers the set of operations which describe the subject-matter of a document or query (facts, concepts, figures, images, etc.) and the products which result. These operations and products, commonly known as 'classification', 'indexing', 'condensation' and 'analysis', have so many features in common that they can be regarded as the various aspects of a single task.

The following account will concentrate on the operations themselves and in particular on their basic principles.

A single document can give rise to several contents descriptions at different levels: for example, attribution of a classification number, the indexing of a dozen terms or so, or an abstract of a few hundred words. Although these operations follow on from each other, they are interdependent and call for the same intellectual procedures.

Contents description takes place at three points in the documentary chain: (a) during production of the primary document (e.g. in the case of an author's abstract or of indexing commissioned by the publisher); (b) prior to storage of the information, i.e. in the middle of the chain; (c) on retrieval of the information and exploitation of the answers (verification and evaluation of the information retrieved), i.e. at the end of the chain.

Objectives

Contents description implies the following objectives:

To describe the contents of documents with a view to informing users.

To decide whether documents should be kept or discarded, to determine the type and level of subsequent processing, or to work out their categories for shelving purposes, as the case may be.

To shelve the documents.

To store information on the document with a view to retrieval, i.e. to see that the files contain references to the documents under the appropriate headings.

These objectives are summed up in Table 1.

TABLE 1. Objectives and moment of contents description

	Describe	Select	Shelve	Store
On production	Yes	Yes	No	Yes
In mid-chain	Yes	Yes	Yes	Yes
At the end of the chain	Yes	Yes	Yes	Yes

The contents description of queries serves to: (a) ascertain their scientific field; (b) clarify and order the various subjects involved; (c) express them precisely and without ambiguity; (d) translate the result into the most appropriate terms of the documentary language, if necessary.

Contents description is undertaken because the original document is too voluminous to be used as such, because the author and user do not necessarily employ the same vocabulary with the same meaning, and because a system can only work properly when the formulation of user queries coincides with its representation of the contents of the documents.

Contents description may be more or less detailed, depending on how the document will in fact be used. The idea is not to make the document known for its own sake but to facilitate use of the information it contains, bearing in mind certain practical considerations such as user needs, subject field, the resources of the information unit, the products and services provided and cost-effectiveness.

User needs: depending on the user's level of qualification, specialist field and reasons for wanting the information, he expects different kinds of service and a corresponding range of specific products resulting from different types of processing.

If, for example the unit's clientele want a brief summary to keep them abreast of current developments, the description will be short, highly selective and presented in an information bulletin that will quickly become out of date. If, on the other hand, the unit is dealing with researchers wanting in-depth information, the description should be full and detailed.

Subject field: the specialists in each field utilize a wide variety of documents, carriers and other items (maps, graphs, tables, statistics, symbols, etc.). They employ a vocabulary and concepts ranging from the general to the highly refined and technical, and the scope and variety of their activities—and hence their requests for information—can differ enormously. All these requirements call for the appropriate type of processing.

Human and material resources and the organization of the information unit also influence the type of processing. A set of documents intended for feeding into a computer and analysis by a team of subject specialists cannot be treated in the same way as when the unit has at its disposal only one or two all-round documentalists.

The products and services expected of the information unit necessitate operations of varying length and complexity. A piece of information given over the telephone by a question-answer service, a descriptive bibliography in which each document

is classified under a main heading, a subject index referring to an analytical record or critical abstract are all different products which call for varying levels of detail, speed and precision of access.

Cost-effectiveness: as available resources are always limited, they have to be fully utilized by satisfying the maximum number of requests. If, for example, the indexing of ten documents with ten descriptors for each document costs \$200 and indexing with twenty descriptors costs \$200 more, it may be more useful to process twenty documents at the lower level of analysis than to go for a more refined description if, that is, only a few users need greater precision.

The products resulting from the operations described under the generic term 'contents description' are of various types, which can, if necessary, be combined for a particular document. With the development of information-handling techniques, these products have been given specific names in the different categories of information unit.

Today there seems more reason to distinguish the various types of contents descriptions according to four criteria: (a) the number of terms and symbols used; (b) the precision and specificity of these terms and symbols; (c) the internal organization of these terms and symbols; and (d) the number of primary documents that are described or referred to. The higher these values the more complex contents description becomes.

The most common products correspond to the various levels of description of a given primary document, namely: (a) classification, or the attribution of a descriptor; (b) indexing, which consists in attributing one or more descriptors with or without hierarchical links between them; (c) abstracting (also called condensation), whereby the contents of the document is condensed in a natural language; (d) extraction of data, i.e. of specific items, often in the form of or related to figures, which can be reutilized directly.

There also exist contents descriptions which span several documents, relating them to each other so as to obtain an overview of a particular subject; such as state of the art reports, synthetic reviews and periodical syntheses.

Each of these products can vary in its level of detail and in its complexity, i.e. in the strictness of its rules of presentation. An abstract, for example, can be long or short, indicative, analytical or critical; indexing may involve the straightforward juxtaposition of descriptors or the construction of sentences in which the descriptors are linked together by means of a special grammar. Secondly, a single document can serve as the basis for several types of description in a particular system, for example, for classification, indexing, condensation and the extraction of selected data.

However long and complex the document to be processed and the desired product (see Fig. 4), contents description follows the same basic procedure. Leaving aside the question of precision and the logical structure of the vocabulary employed to describe its contents, a thousand-word text can be described in one, ten, a hundred or even up to a thousand words. However long the product, the operations involved are similar.

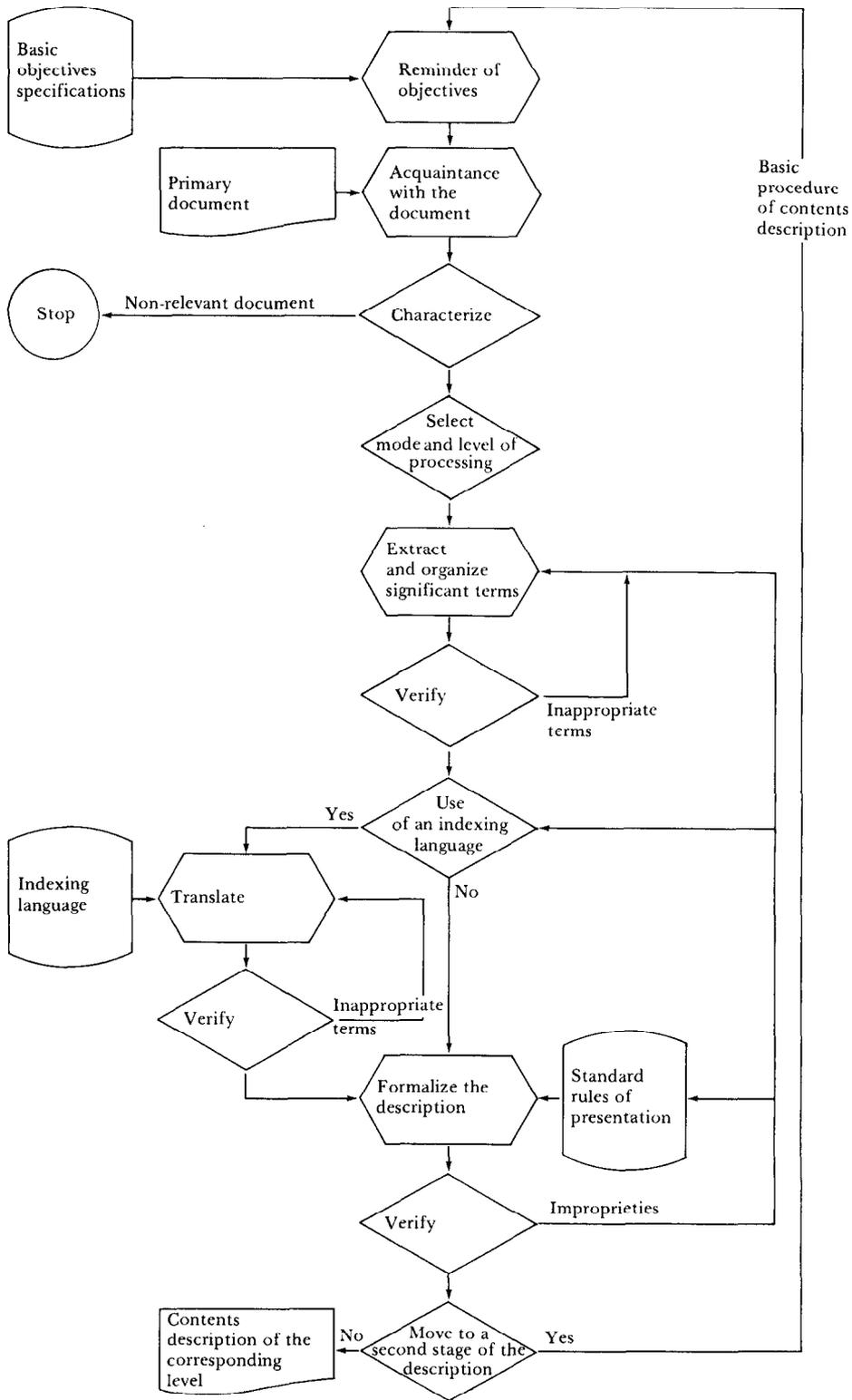


FIG. 4. Basic procedure of contents description.

Basic procedure

The basic procedure may be broken down as follows:

1. **Reminder of objectives:** the first step is to recognize the relevant stage of processing, decide what is wanted and the type of product to be produced, and clarify the nature and purpose of the end-product.
2. **Acquaintance with the document:** a brief general examination of immediately discernible characteristics such as title, date, author, nature, form, etc.
3. **Characterization:** determination of the type of document in relation to categories used by the system.
4. **Determination of the mode and level of processing** in the light of the document's value and the system's rules.
5. **Extraction of significant terms.**
6. **Verification** that the terms extracted are relevant, i.e. that, out of context, they truly represent the actual contents of the document.
7. **Translation** of the extracted terms to meet the requirements of the indexing language used by the system; in the case of a natural language abstract, more explicit or more appropriate equivalents are chosen if necessary.
8. **Verification** that the selected descriptive terms are relevant, that these new terms truly represent the actual contents of the document without adding or subtracting anything.
9. **Formal description:** application of presentation or writing rules, drafting the description, converting the selected terms into the corresponding codes or symbols, and so forth, as the case may be.

Contents description is a continuous process, i.e. when a single product with several levels of description is required—indexing with three series of increasingly precise descriptors, for instance—the basic procedure is applied at each level (see Fig. 5). Similarly, when one sets out to produce several types of contents description such as a classification, a two-tier index and a 400-word abstract, the same basic procedure is followed for each operation, though each further refinement will take previous results into consideration.

As the description becomes more and more elaborate, the factors affecting the process (objectives, limitations of the system, precision of language, consistency between levels, etc.) likewise become increasingly complex. In practice, however, the different types of contents description based on a single document are not always tackled in order of complexity.

The type of primary document to be described determines how easily and quickly these operations will be carried out. Material aspects to start with: images, for example, are more liable to ambiguous interpretation than a sentence for which, moreover, there are more readily available means of checking, such as dictionaries.

Processing is also greatly influenced by the nature of the contents: a document aimed at the general public, for instance, is easier to understand than a technical work or patent.

Certain types of document (statistical yearbooks, patents, reports on experiments, etc.) unlike many others such as essays, articles, etc., are almost always made up of the same subsections, often in a predetermined order.

When the analyst first assesses a document for the purpose of contents description he should take care not to be swayed by the presentation of the subject or by his own reactions. This is particularly important, and difficult, for audio-visual documents.

There exist a number of more or less formal techniques for coming to grips with a text, object or image, which speed up and make more systematic the description of documents (methods of fast reading, for instance), but reliable contents description needs practice.

After deciding to keep the document and after fixing the requisite level of

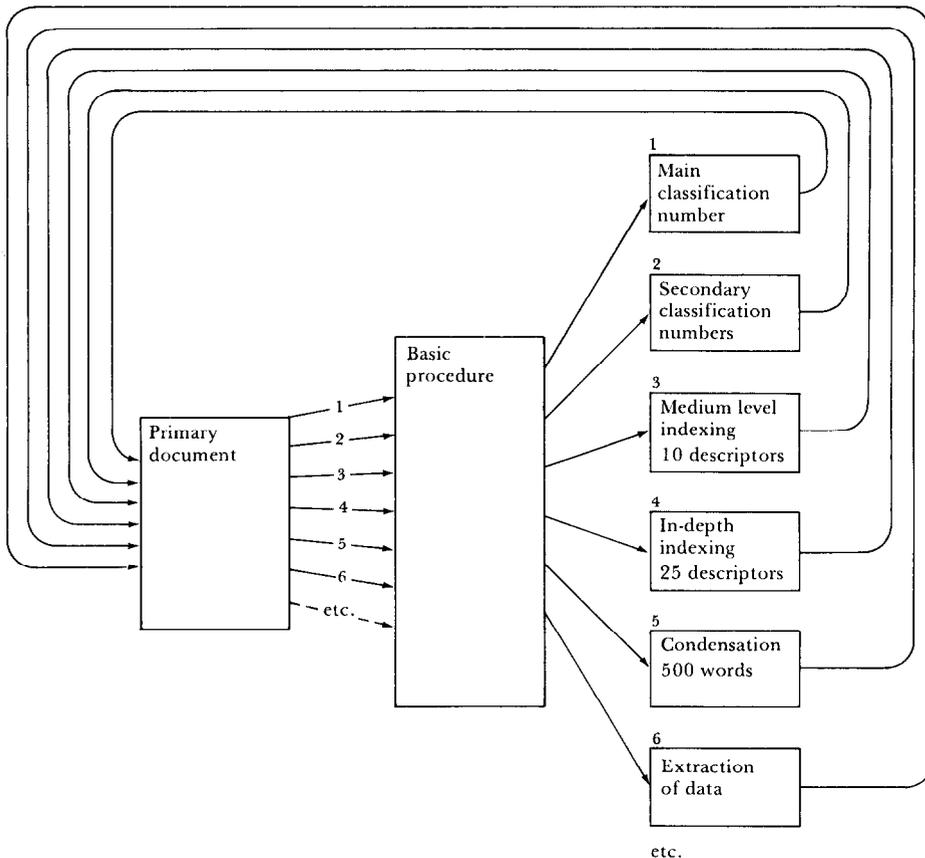


Fig. 5. Tentative graphic presentation of contents description as a continuum.

detail for processing (the first four stages of the basic procedure), the most suitable method is selected. In other words: (a) determining the number of successive runs of the basic procedure; (b) fixing the content to be covered by each run (for example, a quick look at the document as a whole to identify a concept, a more detailed examination of it to identify concepts, examination of a given section to identify an object, and so forth); (c) selecting the most suitable techniques for reading, listening or viewing.

Fundamentally, the point of contents description is to identify and select a limited number of elements within an often voluminous document. Accordingly, it is quite natural to start by searching for the most 'obvious' elements, such as discipline or main subject, before going into greater detail.

Man-made documents at least are given a certain structure: they fall into logical sections or chronological sequences which can usually be distinguished as separate units which then facilitate identification of the contents.

Generally speaking, all documents begin with a section that serves for identification (e.g. the title page of a book) and contains the most important information (author or authors, title and subtitle, date, individuals or organizations associated with the work, summary, table of contents, etc.). This will already give some idea of the work's nature and subject field.

In many cases the document will contain a table of contents, summary, author's abstract, preface or introduction, which describe the subject-matter in abbreviated form.

The actual structure of the document—its division into chapters or sections, the presence of subsidiary titles, notes, illustrations or a bibliography, etc.—may also point to the subjects covered and the type of approach employed. These indicators are generally marked by special signs such as spacing, special topography, the use of numbers or symbols, etc. If a detailed description is required or if anything is not clear, the document must of course be examined in detail.

In all operations concerned with contents description three points of view co-exist:

First, the author's approach to his subject-matter reflects his own particular objectives and ideas, which may be strictly personal.

Second, users regard the author's product from the standpoint of their own concerns and their own varying information needs, which do not necessarily coincide with those of the author.

Third, the information system must satisfy, over a fairly long period of time, the needs of a number of users who do not all want the same level of detail or the same information.

The aim, therefore, is to reach a compromise between these interests by strictly adhering to the methods and rules of contents description and by using a documentary (or index) language.

Contents description must possess the following qualities:

Relevance: the description must be as true and complete a representation of the

document as possible, reflecting not only its own characteristics but also the objectives of the information system, in other words, user needs.

Precision: the rule of relevance requires the description to be as accurate, or as unambiguous, as possible. The document is first of all described with the most precise terms it contains. If more general terms are called for they should be added at the end of the procedure.

Coherence: as already stated, description has to deal with numerous authors and numerous users and is itself performed by different people; it must, furthermore, provide information that can be utilized for as long as necessary. In consequence, it is important to make the descriptions as stable and uniform as possible; in other words, the concepts or objects concerned must always be expressed in the same way by the person or persons working on contents description. It must also be easy to identify and introduce changes that may become necessary later on without upsetting the description as a whole.

Judgement: this is the delicate quality criterion. The description must, of course, be objective or neutral, that is, with nothing added either accidentally (through choice of terms) or, worse, deliberately (by personal comments or value judgements) to what is in the original document. At the same time, however, it requires judgement to assess the validity of the information given, to extract what will be useful for the system, and to correct false interpretations arising, for example, from the author's unsatisfactory choice of terms.

Concision: that is, if the contents description is used for the storage of the information or to inform users. In all cases, it must be clear and easy to consult.

Contents description may be produced by the author or authors (author's abstract and/or index), by specialists working for publishers (generally or indexing), or—the most usual case—by agents of the information units, with the latter either employed exclusively for this work (the analysts of a descriptive bulletin or the indexers of a documentation centre, for example) or, as sometimes happens, called in by the information unit as subject specialists to do all or part of the contents description. But whoever does the work must possess a precise, orderly and systematic turn of mind, good judgement, a flair for analysis and intellectual rigour.

Techniques

The techniques of contents description are backed up by various instruments and organizational methods.

One frequently used instrument is the input sheet, i.e. a special card for recording descriptive elements. If there are no input sheets, there may at least exist a structured list of these elements to which reference can be made.

Many information units draw up manuals or guides outlining the main problems likely to be encountered, the most common situations, the rules to observe and typical solutions for each case.

Sometimes, especially when a lot of detail is required or the nature of the primary documents (films, for example) makes it necessary, the information units employ grids that specify, in a predetermined order, all the data to be included.

Computers, of course, are also, and will be increasingly employed. The automatic analysis of texts is already operational in a few fields and automatic indexing can be carried out by using statistical methods (word frequency) or methods based on grammatical analysis.

It is, however, more common to use computers for handling the indexing language, thus easing the translation of terms extracted from the original document, for supplementing this description by linking the selected terms with other terms that are to be associated with them, or for translating descriptions from one language to another (in this case, the descriptors have to obey the very strict rules laid down for the purpose).

The end-products of description may be in printed or machine-readable form.

Those in printed form may be found in primary documents (author's abstract, index of a book or periodical), grouped together in a wide variety of publications (e.g. current bibliographies, express information bulletins, etc.), or printed on cards of various shapes and sizes for use in card files.

In machine-readable form, they are transferred to various carriers (punched tapes, punched cards, magnetic carriers) for exploitation in this form or for the construction of files, usually on magnetic tape, which are then directly exploited by the computer (displayed on an output printer or visual-display unit) or used for computer-produced bulletins and indexes.

These forms of presentation, which reflect the various types of exploitation and dissemination needed, impose limitations in regard to the layout and length of contents descriptions.

Check questionnaire

Is contents description applicable only in the middle of the documentary chain?

To produce a description, must one begin by reading the whole of an article in detail?

Can contents description bring out elements that are not explicit in the original document?

What categories of people work on contents description?

Are the intellectual operations needed for the various types of contents description basically different?

What are the qualities of a good contents description?

What are the aims of contents description?

7 Documental languages

The documental (or indexing) language is the conventional language used by the information unit to describe the contents of documents with a view to the storage and retrieval of information.

There exist many types of documental language distinguished by their elaborateness, scope, organization, utilization, etc. Historically, classifications and subject headings have long been used by information units, but new techniques and new needs have led to the emergence of new types of language which are sometimes contrasted with the former approach. However, whether we speak of classifications, subject headings, keywords, lists of descriptors, thesauri or lexicons, all these languages belong to the same family, serve the same purpose and have many traits in common. A documental language is used for the intellectual processing of documents, i.e. for entry operations in the information storage and retrieval subsystem and for output and dissemination operations.

As language is involved, many studies on documental languages tend to stress the linguistic aspects, but it must be clearly understood that they serve primarily as tools for the performance of specific operations, carried out under specific conditions to meet specific needs. These functional requirements are essential and quite as important as linguistic considerations, if not more so.

Natural languages

Natural or spoken languages have certain features which make them difficult to use as such for the processing of information. To start with, there exist a great many natural languages—several hundred—each with such a large number of terms—several tens of thousands—that the files would inevitably become very cumbersome.

Natural languages are adapted to written and oral modes of communication in which speakers establish a form of dialogue in which time and space are relatively important and which make room for nuances, associations of ideas and the expression of emotions and values. The retrieval of information from a file or its dissemination in the form of a documental product are totally different modes of communi-

cation: for rapid and reliable retrieval, the information has to be expressed in the briefest possible way and without ambiguity. Accordingly, documentary languages condense and simplify natural language (this explains the frequent reference to a 'controlled' language or vocabulary), keeping only a small proportion of the words, a few forms and little or no grammar. In so doing, however, they have to preserve as much as possible of the richness of the original information, respecting its content and associations and, at the same time, be as simple as possible to handle by the information specialists of the units and by users. These two requirements are in fact pressing documentary languages in the opposite direction, towards a wider vocabulary and more varied structure.

It is still possible to process information in natural language (or free text) up to a certain extent, thanks mainly to computers, which reduce the search-time involved to perfectly acceptable proportions. Information units with this approach do not use a documentary language to describe the information but content themselves with descriptions supplied by the authors (titles, abstracts, extracts or the full text) which are recorded and subsequently compared with the queries. This technique assumes that the natural language concerned is sufficiently precise, which is true for technical or scientific languages, while in many other cases the precision is more apparent than real and in some (the social sciences, for instance) is altogether lacking. For their part, users must know all the alternative expressions that could be used to formulate the information they are seeking, otherwise a certain form of documentary language consisting of equivalents for the terms they have chosen for their query will be needed for interrogation. These systems also make use of logical equivalents whereby terms can only be selected if they are associated with other terms in the recordings. In practice, the user often has to fall back on access dictionaries or documentary languages to formulate his query.

Not all the various types of word in the natural language convey the same amount of information: there exist nouns and adjectives, verbs, conjunctions and adverbs which define the nouns or relate them to each other, and all these elements, moreover, follow their own rules. Some of them occur time and again and provide little information whereas others represent central concepts in a particular field and may be applied to any piece of information (for example, each year thousands of documents are published on agriculture and the term 'agriculture' will be of very little use for an agricultural documentation centre). The documentary language must find a method of dealing with each type of word that reflects these characteristics.

Grammar is the means whereby words are linked to one another in accordance with precise rules in order to express an idea or fact. It changes the form of certain words (suffixes to indicate the plural, the person or the tense of verbs, etc.) and alters the information contained in the words alone by adding specific details such as the context, point of view, cause and effect, time and place, etc.

Certain relations between words in the natural language are implicit and the documentalist tries to make them explicit. Various types can be distinguished.

Hierarchical relation. A given term designates a specific object or pheno-

menon, or part of one, which belongs to a particular set, itself designated by another term. For example, the words 'boat', 'aeroplane', 'car' are all specific means of transport, the sheepdog is a particular type of dog, which is a particular species of mammal, which in turn is a particular type of living creature. In this case the relation is between the general and the specific, but hierarchical relations can also link the whole to the part, as in 'human body', 'arm', 'hand', 'finger'.

Certain words can belong to several different sets: a modern metal chair, for example, is a piece of furniture, an object made of metal and an example of a particular design. This is known as poly-hierarchy.

Again, certain words derive from one word or the same root and may have a hierarchical or associative relation while designating objects belonging to different groups (for example, carbon, carbonic acid, Carbon-14, carbon compound or urea, uraemia, urethra, urology).

Certain words have a **relation of equivalence**, called 'synonymy'. For example, and older term ('aerocraft') and a newer term ('aircraft'), a popular term ('aspirin') and a technical term ('salicylic acid'), a general term ('feline') and local terms ('panther' or 'jaguar'), and terms with more or less the same meaning ('murder', 'homicide').

The equivalence is sometimes very approximate, with distinct concepts treated as synonymous in a particular context or group (e.g. 'genetics' and 'heredity', 'journalist' and 'reporter'). These are quasi-synonyms.

Conversely, there are words that express contrasting concepts or objects, such as 'wealth' and 'poverty' or 'organic' and 'mineral'; this is an antonymic relation.

A great many words are polysemous, i.e. the same form designates different things. For example, 'wood' and 'the woods', or 'ward', which can be a young person in someone's charge, an electoral district or a room in a hospital. Another type is a term used in different subject fields with special meanings: the word 'attraction', for instance, can refer to a physical phenomenon, a psychological phenomenon or a cultural event.

Some words have associative relations, i.e. they refer to objects or phenomena whose associations when regarded from a certain point of view, overlap (e.g. 'sport', 'education', 'public health', 'recreation').

Words also have their own meaning and connotation which vary with the particular social environment or activity concerned. For example, 'pocket money', though possible to understand linguistically, would be meaningless in a traditional society; 'seismology' is an important branch of the earth sciences but would have considerably less impact in a country with no earthquakes; 'charity' does not mean the same thing in a Western society as in an Islamic one; a window has neither the same importance nor the same associations for an architect, a decorator or a joiner.

Documentary languages have to allow for such relations and differences in meaning, and eliminate in advance all those ambiguities which are normally reduced by the context and dialogue of natural language communication. For documentary languages, where each word is considered in isolation, the situation is quite different.

Documentary languages

The components of a documentary language are:

Words used to describe information, known as 'descriptors'. They are drawn from the natural language, reduced to a single grammatical form, and invariable (usually the singular of a noun). They may be simple or compound words. Some ('specifiers') are used to define the meaning of other descriptors and cannot be employed alone.

Words drawn from the natural language which are related to the descriptors; they are listed with a cross-reference to the corresponding descriptor and, being 'controlled' by the documentary language, cannot be used to describe information.

The relations between descriptors, in terms of hierarchy, equivalence or association, which make it possible to group concepts together under a single heading or to broaden out or narrow down the search. These relations are signalled by the following codes: BT (broader term), NT (narrower term), NT 1, 2, 3, etc. (specifying level, in decreasing order), USE (use) for a natural language term which has been linked to a particular descriptor, UF (used for) to show what natural-language words are covered by a particular descriptor, RT (related term) to indicate related descriptors. The relations involved are usually in both directions. For example:

```
DRAWING
UF Sketch
BT GRAPHIC ARTS
NT 2 TECHNICAL DRAWING

Sketch
USE DRAWING.
```

Relations between descriptors alone, a consequence of their being logically grouped into a varying number of different sets and subsets (for example, main classes, classes and subclasses of classifications, or the semantic fields and groups of combinatory languages). These sets are made up of descriptors which belong to a particular hierarchy or simply relate to a topic defined for the occasion.

Notations which may be numeric (100, 101, 110, etc.), alphanumeric (A10, B15, etc.) alphabetic (AAA, CHA, Aa, etc.) symbolic (with punctuation marks) or use syllables to identify descriptors, which are then entered in this shortened form in the bibliographic records and files.

General notes (scope notes), usually for certain particular groups of descriptors, which state in what sense a particular term of the documentary language should be used, what other terms to use if the need arises and the terms from the natural language which are covered. Scope notes may even constitute a kind of definition, and they are used whenever there exists a danger of confusing the meaning or the predetermined usage of a descriptor. For example, 'building' might be

accompanied by the following scope note: 'Use only to describe the parts of a construction (walls, foundations, roof, etc.). When the purpose is intended, use the narrower term private dwelling, industrial building.'

A certain amount of syntax, expressed through the order in which descriptors are presented, by the use of words or signs to link them together or show their functions (see 'syntactic language' below) or by the use of a limited grammar such as a few standard sentences capable of representing all possible associations between words of the natural language, to express concepts of use to the documentation systems.

Graphs showing descriptors and their relations.

The only indispensable feature of a documentary language is the list of descriptors; the presence of other elements depends on need and type of language.

The layout of documentary languages can take the form of printed documents or machine-readable computer files, though computerized systems utilize both types. It can include:

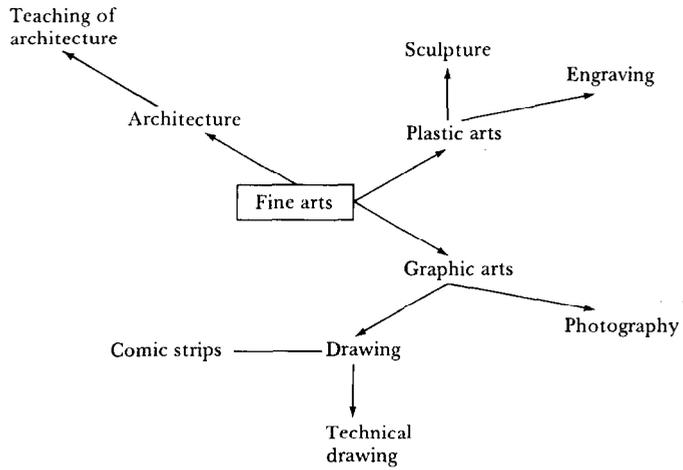
An introduction, which provides at least some guidance as to the contents of the language, its organization, the concepts employed and how it should be used.

Lists of descriptors, presented alphabetically or systematically (by set and subset); in either case the lists may or may not indicate possible relations between the descriptors. Where such relations exist, they should be shown on at least one list. Documentary languages are generally presented in two ways, as an alphabetical list for checking the existence of a descriptor and as a systematic list for checking the meaning or connotation of a descriptor in terms of the category to which it belongs ('cow', for instance, could be placed under 'zoology' together with all the other animals, but a document on expanding dairy herds might well have to be described by the word 'milk' from the group 'animal production'). In machine displays, the descriptors are often listed with the number of times each one appears in the file. With computers, one can also produce permuted alphabetical lists which include all the individual terms of descriptors composed of several words in the general alphabetical arrangement.

Graphic displays, which show the relations between terms as defined by the systematic list. They make it much easier to grasp the documentary language but are unfortunately not used by all systems. They can take the form of concentric circles with the descriptors arranged in segments or clusters, of square maps with the descriptors grouped in clusters within polygons, of arrow charts (descriptors linked by arrows), tree structure charts, or graphs, but such diagrams only work with a few descriptors at a time (see Fig. 6). It is quite common for lists and graphic displays to employ various conventional signs or typographical characters to mark the different types of descriptor (proper names, place names, taxonomies). Documentary languages which control a great many natural-language terms with cross-references to descriptors may present them in a special list known as an 'access dictionary'.

The types of documentary language are distinguished by a number of criteria: the ordering or construction principle, the size of the subject field covered, the

Arrow chart



Tree-structure chart

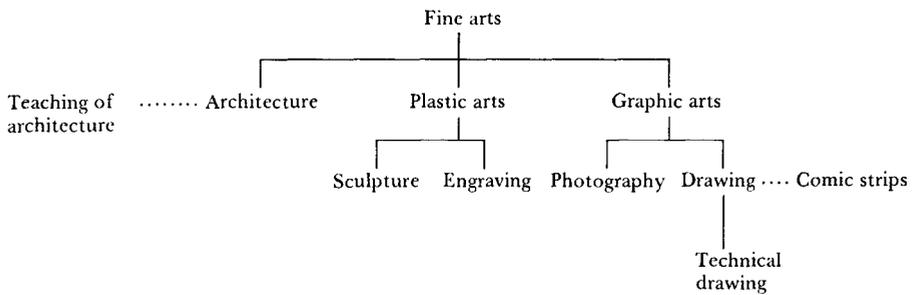


FIG. 6. Charts for the representation of a documentary language.

types of word employed, the types of relation between words, the type of arrangement, the number of natural languages controlled and the type of utilization.

The ordering principle may be a predetermined systematic hierarchy (as in classifications), descriptor frequency and usage (as in lists of subject headings), or an authority list based on one or more points of view (as in faceted languages).

The subject field covered may be knowledge in general (as in encyclopedic languages), a discipline or certain aspects of various disciplines (specialized discipline-oriented or mission-oriented languages), or a small part of a discipline or subject field (microthesaurus).

The types of words employed can be single words (but only in uniterm languages), single and compound words (the more usual case) or compound words in either natural language order or reverse order (as in lists of subject headings).

Inter-word relations may be absent altogether, all words, at least in theory, being regarded as equivalent (as in the lists of descriptors); they may be implicit, or clarified by means of notations and/or a systematic arrangement, or they may obey the rules of a grammar (as in syntactic languages).

As for the type of arrangement, it may be systematic (as in classifications), alphabetical (as in lists), decimal (as in decimal classifications), mixed, open-ended (as in languages likely to be extended or revised) or closed (as in languages fixed once and for all).

Documentary languages can be developed in a single natural language, in a natural language but with equivalents in one or more others (with access dictionaries for the other languages), in two or in several natural languages (multilingual languages).

They can be used for a single entry of each item, for multiple entries (combinatory languages), for superficial or in-depth contents description, or as a bridge to span several languages (as in metalanguages and macrothesauri).

Each documentary language will combine these approaches in its own way to provide the best service for users. Although it constitutes a certain way of representing selected knowledge and objects, its primary function is in fact to serve as a tool and, as such, it must take into account user needs, the structure and functioning of the documentation system, the types of product and service for which it is suited, the skills of the information specialists using it, the number and nature of the documents to be processed, and so forth. The more specialized the information unit, the more numerous the documents and the more complex the products, the more the documentary language should be extensive and ordered. The less competent the unit's staff in the subject fields covered, the more the language must be restricted, simple and structured.

Fully hierarchized and pre-co-ordinated languages like classifications have long been contrasted with more recent languages without hierarchization or with discontinuous and combinatory hierarchization, such as lists of descriptors and thesauri.

The former reflect the state of knowledge at a particular moment in time: all the possible combinations of concepts have been foreseen in advance and it is only

possible, in theory, to express one aspect or dimension of the information. They are more difficult to modify. The second type are easy to adapt and permit any combination needed to describe all aspects of the information. In practice, however, these distinctions are now becoming blurred: facets in particular are making it possible to deal with more than one viewpoint in classifications, while combinatory languages are having to become increasingly structured as they grow larger.

Pre-coordination and post-coordination represent two contrasting approaches to organization and use of documentary languages.

Pre-coordination involves the selection of descriptors, in many cases compound words, which cover the whole of a concept ('irrigated cultivation of cereals', for example). If the documentary language itself possesses a pre-coordinated structure, this descriptor might be located in the 'irrigation techniques' subset and a document on the subject could be described immediately; even if the document was more concerned with the various cereals and their yields than with irrigation techniques it would be found among the documents on that topic.

In contrast to this approach, post-coordination reduces concepts to their most simple constituent parts. In our example, for instance, the descriptors 'cultivation techniques', 'irrigation techniques' and 'cereals' would be associated to describe the document in question. As each descriptor would belong to a different group, the document could be located through descriptors covering any of these aspects of its subject.

The first approach is more precise but less flexible and limits the retrieval of information. The second one is the opposite. In practice, the choice between them depends on the practical conditions under which the documentation system operates. In many cases, the two approaches are associated (i.e. the pre-coordinated descriptors are combined) in order to achieve maximum efficiency.

Classifications

Classifications are documentary languages in which the descriptors used to represent all the concepts and objects relevant to a given subject field are systematically ordered in accordance with one or more material or intellectual criteria. They are consequently pre-coordinated languages and are usually based on the hierarchical relations between terms, either in general or at least for the various classes and subclasses. The hierarchy, of course, derives from a particular point of view at a given moment in time ('adultery' would, depending on the time and place, be classed as a crime, a vice or a form of social behaviour, for instance).

Owing to their hierarchized structure, classifications generally attribute a number to each descriptor (figures, letters, or a combination of the two) which indicates its position, i.e. its relative importance and the group to which it belongs. The number, being shorter and easier to handle, replaces the descriptor in the various operations. Certain 'decimal classifications' employ a numbering system

with ten positions, with each class, subclass, etc. divided into ten parts (for example, main classes numbered 0 to 9, classes 00 to 90, the subclasses of class 10 from 100 to 190, and so on). The advantage of this system is its simple and continuous structure, but it can make arbitrary distinctions impossible to avoid.

Classifications work well when the subject field is small and stable but, though spaces can always be left free for future use, they are not easy to update or transform in the event of important changes in a particular discipline or field of activity. Unless highly specialized, they are more often than not restricted to describing the main subject of a document and then only from a single point of view, i.e. each document receives only one classification number or, at a pinch, two or three, but never more.

Classifications are used for ordering files but also for the physical shelving of documents. This is why they are recommended for libraries allowing free access to the shelves for 'browsing'. They are the oldest form of documentary languages and are primarily suited to the work of libraries. There exist several types.

Universal or encyclopedic classifications cover the whole field of knowledge. They are employed by libraries such as national, university or public libraries, dealing with a great many or even all subject fields, but can also be useful for information units with multi-disciplinary interests.

They are, however, not very suitable for specific subject fields since the numbers then become very long. They require regular updating, but this procedure often takes so long that the units concerned are forced to adapt the classifications for their own purposes, thus sacrificing direct communication and exchange. The best known are the Dewey Classification (DC) and the Universal Decimal Classification (UDC).

The Dewey Classification was invented by the American librarian Melvin Dewey. Its first edition (1876) had 1,000 headings and the current one, the eighteenth, contains 18,000. Besides English, there exist full-scale versions for French and Spanish, a translation into Arabic is in progress and there have been a great many partial translations. It is a decimal classification with ten main classes (0 General Works, 1 Philosophy, 2 Religion, 3 Social Sciences, 4 Language, 5 Pure Science, 6 Technology, 7 The Arts, 8 Literature, 9 History, and common subdivisions for place and form). The Dewey Classification is maintained by the United States Library of Congress and is widely used throughout the world.

The Universal Decimal Classification was started by the Belgian lawyers Pierre Otlet and Henry Lafontaine in 1895 and based on the Dewey Classification. It is maintained by the International Federation of Documentation (FID) and exists in a large number of full, abridged or special editions (e.g. for education, meteorology, etc.) in many languages. It is utilized above all in Europe. The FID regularly publishes additions and corrections which are based on the work of specialized committees.

The UDC uses the same classes as the DC except that Classes 4 (Language) and 8 (Literature) have been merged, leaving Class 4 empty for the time being. It has three categories of numbers. The main numbers are related to concepts or objects

and are divided among the ten classes of the main tables. The analytic divisions, related to general characteristics, can be applied to any main number or its subdivisions; they appear in the main tables immediately after the number concerned (for example, 636 Stock Breeding; 636.084 Feeding Methods). The common divisions are characteristics related to language, place, population, time, form and point of view; they may be applied to any main number and are set forth in auxiliary tables. In addition, the UDC uses punctuation marks to distinguish between the different kinds of number, and it is possible to combine several numbers by using relational symbols: a general relation is expressed by a comma (,), an intersection by a colon (:), addition by a plus sign (+) and extension by an oblique stroke (/). Although these possibilities enable the UDC to describe complex subjects with precision, it remains, like all classifications, a hierarchical number-based classification, which makes it difficult to show the relations between subjects.

Faceted classifications arrange concepts and objects into classes but they are multi-dimensional, i.e. the items are ordered within each class from different points of view. For example, buildings could belong to the main class of Techniques and be regarded in terms of materials (wood, earth, bricks, stone, etc.), utilization (dwelling, industry, trade, services, etc.) height (one, two, three or n storeys), location (urban or rural) and so forth.

Faceted classifications do not as a rule list all the possible subjects but only those which are useful. These are classified by facet, which can then serve as a guide to future extension. The use of facets, which may be of a standard type or adapted to each subject category, makes it possible to describe complex subjects with great accuracy.

This system of classification was developed by the Indian librarian, Shiyali Ramanrita Ranganathan, from the research of the American, Bliss. In 1933, Ranganathan produced a universal classification, called the Colon Classification (CC) which was founded on this principle. In the CC, the facets belong to five basic categories—personality, matter, energy, place and time—which always appear in the same order. The system uses a complex notation and syntactic relations to show the relations between two class numbers (e.g. W og U: influence of geography (U) on political science (W)). Though the notation is rather complicated, this documentary language is highly sophisticated and capable of providing a full description of any piece of information.

The CC is employed much less than the other universal classifications but work on it has exerted a considerable influence and the facet principle is extensively used in many documentary languages, thesauri as well as classifications.

Special classifications are classifications designed for the needs of a particular information unit or particular category of unit concerned with the same subject field. Consequently they vary greatly in scope, principle of classification, type of organization, numbering system, etc. However, their advantages—they are closer to the specific needs of the units employing them and easier to update—are offset by the fact that they make communication between units more difficult.

There exist faceted special classifications, such as the London Institute of

Education's classification of education or the SFB, a classification of building and construction used in twenty-three countries. Certain special classifications are peculiar to a single unit while others, such as the Oxford classification for forestry, are used throughout the world.

Taxonomies and systematic lists are a particular form of classification, being at once the product and the instrument of scientific research. The items are ordered hierarchically, not from an abstract standpoint but in accordance with logically arranged observable characteristics. Animals, plants, minerals, chemical substances, soil and geological strata have been classified in this way. These systems have the advantage of being highly precise and an accepted reference for all scientists working in these fields. Information units covering such subjects are therefore advised to use them as documentary languages or to incorporate as much of them as they can or need into the language they employ. It should be noted that certain details can change with progress in research and care must be taken to choose those which are the most widely accepted by specialist users.

Subject headings are descriptors formed of single or compound words selected in most cases empirically, from the text of the document, with the object of describing with moderate accuracy the various subjects covered. As each descriptor is independent of others descriptors, it is a combinatory language. The lists of subject headings generally include only cross-references or 'see also' references (e.g. 'Documentary language, see also Classification, Documentation, Linguistics'). One or more subject headings may be used to describe a document: for example, a document dealing with the impact of currency fluctuations on the balance of payments of developing countries should be classified under 'economics' and, to help pin-point the various subjects covered, certain subject headings would be attributed, such as 'currency fluctuations', 'balance of payments', 'international trade', 'terms of exchange', 'developing countries'. The subject catalogue is arranged in alphabetical order of subject headings and the record of the document in question would be found under each heading. Another possibility is to combine subject headings, in which case they become secondary headings (e.g. balance of payments—developing countries (secondary heading), developing countries—balance of payments (secondary heading)).

Subject headings, together with their sub-headings and cross-references, are usually set out in an alphabetical list which is arranged in the same way as the file. Natural word order is often inverted to facilitate the grouping of related concepts (in the above example, we would probably find 'payments, balance of').

This type of language is very flexible but too many subject headings make the search long and tiresome. There is therefore a tendency to use only a few for each document and to keep them fairly general, with the result that descriptions of information cannot be very discriminating. They serve mainly for the manual files of libraries, but this type of language is awkward to control and it is difficult to ensure that descriptions are homogeneous.

List of keywords are another type of combinatory language which developed with the mechanization of information units. The distinction between a keyword

and a descriptor is often arbitrary and dependent on the situation; here the term 'keyword' is used for words extracted directly from the natural language of documents and employed in the same form, whereas descriptors represent the outcome of a process of selection and elaboration, which takes place after the terms have been extracted.

Keywords are selected empirically for their ability to express the information content of a document. They make for a highly discriminating description and can be combined at will. They are listed in alphabetical order, but the amount of work involved is reduced by the use of mechanical devices. The problem with this type of language is to ensure consistency, and a selection has to be quickly made, i.e. to sort out certain keywords, which then become descriptors.

Lists of descriptors may be simply lists of the terms selected, arranged in alphabetical order; however, certain synonyms from the natural language can be added under the corresponding terms. A further possible refinement is to establish relations between descriptors, thus producing a 'structured list'; the next step is to group them into sets and subsets to form a 'systematic list'. These ascending levels of organization improve the possibilities of controlling the vocabulary, i.e. avoiding duplication, an excessive number of overprecise words relevant to only a few documents or mistakes in the use of descriptors.

For example, a document dealing with the co-ordination of road and rail transport would be identified, in a hierarchical classification, by means of its class number, 551. A list of descriptors would use a combination of three terms—'road transport', 'rail transport', 'co-ordination of transport'—thus keeping track of three aspects of the document.

This type of language permits accurate description of the information and any cross-referencing that may be desired. It is a very flexible system and can be adapted to changing needs. It is particularly easy and straightforward to use since it bears a close resemblance to natural language.

Complex searches, however, call for a great many combinations which, even with the aid of machines, quickly become a nuisance; moreover, there is still a risk of error because the language is too rudimentary. It is difficult for lists of keywords, like lists of descriptors, to exceed 1,000 items. They are always specialized, dealing with a particular discipline or field of activity. One of their distinct advantages, indeed, is their ability to group together with ease all the useful concepts relating to a specialized activity, particularly an interdisciplinary one, a task for which classifications with their logical structure are not suited.

Thesauri

Thesauri represent a popular method of ordering combinatory documentary languages. They consist of a controlled set of terms linked by hierarchical or associative relations which mark any needed equivalence relations (synonyms) with

terms from the natural language and concentrate on a particular area of knowledge. A thesaurus can range from a few hundred to 20,000 terms, the average size being around 3,000. Each of them has a unique unambiguous meaning (elimination of polysemes and control of synonyms).

They are usually specialized, but some cover quite broad fields: for example, the *Thesaurus of Engineering and Scientific Terms (TEST)* of the Engineers Joint Council which includes over 17,000 descriptors relating to a considerable part of science and technology.

Thesauri are arranged by themes and/or facets, hierarchized subsets and so forth, with a growing trend towards a fully hierarchical layout. Each subset contains up to about fifty descriptors. A thesaurus normally consists of a systematic part, in which the descriptors are arranged in groups, and an alphabetical list. Its advantages are that it is specific, flexible and capable of providing a full description of the information, but its preparation often calls for a great deal of work and it can seldom be re-utilized as such. Moreover, the current proliferation of these languages is so complicating the transfer of information between units that efforts are having to be made to achieve some kind of standardization and interthesaurus compatibility or concordance.

Authority lists are languages with a limited function: they serve as an ongoing record of usage in regard to proper nouns (acronyms and the names of persons, organizations or places) employed in the description of certain documents. The items are arranged alphabetically, sometimes with cross-references (between the new and former titles of an organization or between the full title and its acronym, for example). The purpose of these lists is to ensure that proper nouns are always written in the same way. This is important for an efficient search since the versions found in documents frequently differ. Authority lists are used in conjunction with other languages.

Uniterms are descriptors composed of single words only. 'Road traffic', for example, would be expressed by the descriptors 'road' and 'traffic'. This system, which carries the logic of post-co-ordination as far as it can go, was developed by the American, Mortimer Taube. It allows the vocabulary to be reduced considerably in size but is not at all suited to complex subjects since, to return to our example, a search for the combination road + traffic would also turn up documents on road construction and air traffic.

Multilingual languages are employed by information units or systems whose users speak two or more languages and cannot make do with one alone.

This may involve translating a source language based on a particular language into other languages, or the documentary language could be developed from the start in the various languages concerned. The latter method is better because it stays closer to the particular terminology of each natural language. There exist multilingual classifications, lists of descriptors and thesauri.

Syntactic indicators are terms, symbols or conventional signs which enable the description of a piece of information to include an indication of the role (or relation) of a descriptor with respect to one or more other descriptors. This makes

it possible to avoid ambiguous descriptors and even to build up a kind of sentence which provides a fuller and less ambiguous statement of the information. However, since they complicate the documentary language and are awkward to handle, their use is declining, especially as computer search logics and computerized syntactic languages can do the same job more effectively.

In most cases, a documentary language describes a given piece of information by simply juxtaposing certain terms; the reader does not know what causes what, what is important and what is secondary, and so on. A document on imports of wheat and exports of coffee, for example, would be described by 'imports', 'exports', 'wheat' and 'coffee', but these descriptors would not show whether the wheat is imported or exported or both; for a user interested in the importation of coffee, the document is valueless. To select exactly what he wants he needs the corresponding descriptors to be interlinked.

This can be done by requiring that related descriptors follow each other in a significant order when the entire description is read (for example, 'imports, wheat, exports, coffee'). One can also use links, i.e. descriptors going together could be marked with the same conventional sign: '(imports, wheat) (exports, coffee)' or 'imports (1), wheat (1), exports (2), coffee (2)'.

Another possibility is that three-quarters of this particular document deals with imports of wheat, a point that juxtaposed descriptors completely fail to show. For such cases a system of weighting would be used, in the form of conventional signs for indicating the relative importance of a topic in the document as a whole (e.g. 1 very important, 2 important, 3 of secondary importance). This would give, 'imports (1), wheat (1), exports (3), coffee (3)'. Alternatively, there could be a convention that the relative importance of the descriptors is indicated by their order of appearance. One might need to distinguish more complex relations, such as cause from effect, source from destination. For this, symbols known as role indicators, are appended to each descriptor to indicate its function. For instance, for a document arguing that 'drought causes a fall in coffee exports and the need for more imported wheat', the description could have, 'drought (C), imports (R), wheat (R), exports (R), coffee (R)', with 'C' indicating cause and 'R' result.

Syntactic documentary languages go even further in accuracy description, identifying and encoding a number of possible and useful relations between descriptors by means of symbols, standard sentences whose word order indicates the reciprocal relationship, or a combination of the two. Some can express a few relations while others can cope with a dozen or more. Returning to our example, one could have 'drought = (imports + wheat) A + (exports + coffee) D', in which '=' indicates that the previous descriptor is the cause of those following, '+' indicates co-ordination, 'A' augmentation and 'D' decrease. This document could therefore be distinguished from one—'Exports + Coffee A = Imports + Wheat./Drought./', in which the sign './' indicates a related factor—arguing that 'the increase in coffee exports make it possible to cover the needs for imported wheat in spite of the drought'.

In manual documentation systems, syntactic languages have proved much too

demanding for the benefits conferred. The introduction of computers, however, and progress in computational linguistics now make it possible, especially with the aid of standard expressions (known as canonical sentences) quite close to natural language, to envisage a new and very promising future for syntactic languages.

Compatibility between documentary languages

Compatibility means that a concept expressed by a descriptor in one documentary language can be expressed by an equivalent descriptor in another.

We might find, for example, the following series in four documentary languages:

<i>Language A</i>	<i>Language B</i>	<i>Language C</i>	<i>Language D</i>
Buildings	Buildings	Construction	Public health
Public buildings	Hospital	Medical facilities	Health services
Medical buildings		Hospital	Hospital
Hospital			

The descriptor 'hospital' occurs in all four languages. In theory, then, a document described by means of Language A could be incorporated into a file or data base using any of the other three languages.

In practice, however, this is not entirely true. The presence of the same terms or of a large number of identical terms in different languages is a case of formal compatibility. In Languages A and B, the term 'hospital', though placed at different levels, belongs to the same group, that of 'buildings'. Language C, however, puts it under 'construction', which is a broader concept though still centred mainly on things. But for Language D, 'hospital' belongs to the group 'public health', which considers the activity rather than the building. The formal compatibility between the four languages is totally misleading: there exists organic compatibility (i.e. of structure) between Languages A and B, the possibility of equivalence between them and Language C but no compatibility between Language D and the other three. Compatibility between documentary language is essential for the transfer of information between two units working in the same field or in related fields which tend to overlap. The easiest solution is, of course, for them both to use the same documentary language in one or more natural languages, but for this the units have to operate under fairly similar conditions, which is not always the case.

A more flexible approach is to employ a common structure on the basis of which each unit develops the parts with which it is concerned. A common structure can also be established for documentary languages already in existence. At a pinch,

one could issue a concordance table—a kind of translation—between the languages, but the more dissimilar the structures the less accurate it will be. A solution to this problem should be sought when the time comes to select or construct a documentary language.

Metalanguages or switching languages are used not to describe the information itself but to interconnect different documentary languages. In fact, they stand in a somewhat similar relation to documentary languages as the latter do to natural language. Their function is to integrate the structure of different documentary languages into a single coherent structure and then arrange for all the descriptors to be attributed equivalents and/or attached to an appropriate group, or to be treated as specific. Metalanguages serve to convert information from one documentary language to another, but if the languages are large and if there are many of them, this solution is only economic when a computer is used.

Another more straightforward but less perfectionist solution is to merge the documentary languages without worrying about the differences in structure. This produces an alphabetical list of all the descriptors which is probably sufficiently accurate for practical purposes, especially in the case of specialized languages in fields with a fairly precise natural-language vocabulary.

These instruments serve to seek information in several different files or data bases at the same time.

A macrothesaurus is a thesaurus covering several fields but only the central concepts which command the structure of the more detailed specialized documentary languages. It can be prepared in advance of the specialized languages, and this is in fact preferable since it then provides a single structure on which the latter can be based. But it is more often derived from already existing languages. It forms, so to speak, the trunk and boughs of a tree which support branches produced by the various specialist fields, giving general coherence to the specialized files from the information units whose documentary language it embraces. Other macrothesauri are constructed with fairly general terms to serve as the starting-point for developing a documentary language. A macrothesaurus usually covers a broad field, such as science and technology or economic and social development, but there are some whose function is to back up a documentary language in sufficient detail to serve for the guidance of users. The latter are often presented in diagrammatic form, showing the names of classes and subclasses arranged hierarchically. This is particularly useful for bringing out associative relations between the classes.

Documentary languages must be maintained, since the natural language evolves as knowledge progresses and activities broaden out. This updating also enables the information unit to weigh up the experience it has gained in the description and retrieval of information: certain descriptors turn out to be pointless, some are too narrow, other too general or ambiguous.

It is therefore necessary to monitor the way the language is being employed, to record what problems crop up and what solutions are adopted and to watch over the number of documents described with each term (or two or three terms in order to check relations) so as to prepare the way for periodical adjustments.

Terms not included in the language but which would have been useful in a particular case must also be systematically recorded so that they may be periodically considered for inclusion.

There could arise the need for further descriptors or further relations between descriptors, for the replacement of a descriptor or the elimination of one that serves no purpose, for suppressing relations that cause errors in searching, for introducing scope notes to clarify descriptors that have shown signs of ambiguity, for modifying the wording of a descriptor (by turning it into a compound, for instance) and, in exceptional cases, for adjusting the structure of the language.

Clearly, such changes can be introduced only when the information unit is entirely or partly responsible for the documentary language. If it uses a language produced by other units, it cannot make changes itself, though it can put forward suggestions to the competent organization, and it should in any case monitor utilization of the language for the purpose of giving the necessary instructions or training to the staff.

The fact is that documentary languages steadily evolve. As a rule, they are regularly updated—every two or three years, for example—and in the meantime data is collected for this purpose; there is no question of making adjustments on a day-to-day basis, since this might well produce total confusion. Language maintenance also calls for regular evaluation, either through the criticism of subject specialists who were asked for their views, or by testing description and search procedures and working out precision and recall ratios. This kind of evaluation is often included in the general evaluation of the documentation system as a whole.

The choice of a documentary language must be made with a great deal of care as it represents the core of the system. All the requisite characteristics of the documentation system must be clearly specified. Who are the users? How numerous are they? What are their needs? What kind of queries does the unit receive? Through what channel? What are the unit's products and services? What type of contents description do they require? How many staff are there and what is their level of qualification? What financial resources are available? How much and what kind of information will have to be processed? What information storage and retrieval facilities does the unit possess? What relations exist between the unit and other units working in the same or related fields, in the same country or elsewhere?

All these parameters serve to determine the necessary coverage and capability of the language, its level of specificity and degree of overall precision, etc.

The next step is to see whether there already exists a documentary language meeting these specifications, by turning to the specialized literature or to clearing houses, such as the Institute of Scientific, Technological and Economic Information (IINTE) in Warsaw, Poland. If the answer is yes, the language concerned must be tested on a significant number of documents and queries in order to decide whether it can be used as it stands or whether it will need to be adapted and, if so, how much this would cost. If modification is too expensive or if the language in question does not satisfy essential requirements, the unit should decide to construct one itself.

As there now exist a great many documentary languages whose proliferation hinders communication, and as new languages are troublesome and costly to construct, the initial preference should be to adapt one.

Elaboration of a documentary language

The elaboration of a documentary language requires, first of all, detailed analysis of the documentation system. It should be emphasized once again that the goal is to produce an instrument designed for a highly specific task and not simply to select and build up a logically and linguistically satisfying collection of words.

Having analysed the system, examined existing languages and decided to adapt or construct one, the next step is to establish a work plan that takes into consideration the available human, material and financial resources. The construction or adaptation of a documentary language takes several months—sometimes even several years—and requires assistance from various quarters.

There are two methods of elaborating a documentary language. The *a priori* method consists in going through the existing terminology found in indexes, dictionaries, other documentary languages, taxonomies, etc., and obtaining lists of terms from subject specialists; in the *a posteriori* or analytical method, terms are extracted from a representative collection of documents—not easy to build up—or from the documents and queries dealt with in the course of documentary operations over a reasonably long period of time. In practice, however, the two methods are usually combined.

The next stage is to collect and then select lexicographic data, to begin noting the relations between potential descriptors and grouping the latter into sets of varying importance. The data are selected from a systematic point of view, by theme, rather than individually. Then comes the choice of descriptors and decisions as to the form they should take.

This done, the general system of organization, usually planned in outline beforehand, is worked out. After this, if such is the intention, the relations between descriptors are systematically defined.

Then comes the testing, with specialists asked to evaluate the language and trials involving a representative number of documents and queries.

The documentary language is now published. The initial version will be used for a certain period of time with constant monitoring before being revised for a new edition which will in fact constitute the first operational version.

All this work depends on co-operation between information and subject specialists. If the language is large, it often becomes necessary to call in a specialist in the construction of documentary languages either as a consultant or to direct the operation.

The size of the language depends on the amount of information to be processed but also on the subject field, how specialized the unit intends to be and the type of products and services it will offer. These factors also determine the type of organiza-

tion, but in this case the most important criterion is the desired balance between precision and recall.

Check questionnaire

What is a documentary language?

What distinguishes documentary language from natural language?

What are the drawbacks of using natural languages for the description of information?

What is the difference between a classification and a thesaurus?

What is post-co-ordination?

How is a documentary language updated, and why?

How should a suitable documentary language be chosen?

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(See also the bibliography of Chapter 8.)

Appendix 1. Alternative layouts for a documentary language

<i>Hierarchical list</i>	<i>Hierarchized alphabetical list</i>
I. FINE ARTS	Architecture
I.1 Architecture	BT Fine Arts
RT Teaching of architecture	RT Teaching of architecture
I.2 Graphic Arts
I.2.1 Drawing	Comic strips
RT Comic strips	RT Drawing
I.2.1.1 Technical drawing
I.2.2 Photography	Drawing
I.3 Plastic Arts	BT Graphic Arts
I.3.1 Sculpture
I.3.2 Engraving	Fine Arts
	NT Architecture
	RT Teaching of architecture
	NT Graphic Arts
	NT I Drawing
	RT Comic strips
	NT 2 Technical drawing
	NT I Photography

	Graphic Arts
	BT Fine Arts
	NT I Drawing
	RT Comic strips
	NT 2 Technical drawing
	NT I Photography

	Plastic Arts
	BT Fine Arts
	NT I Sculpture
	NT I Engraving
<i>Systematic list</i>	
FINE ARTS	
Architecture	
BT Fine Arts	
RT Teaching of architecture	
Graphic Arts	
BT Fine Arts	
NT I Drawing	
RT Comic strips	
NT 2 Technical drawing	
NT I Photography	
Plastic Arts	
BT Fine Arts	
NT I Sculpture	
NT I Engraving	

Alphabetical list

Architecture
Comic strips
Drawing
Engraving
Fine arts
Graphic arts
Photography
Plastic arts
Sculpture
Teaching of architecture
Technical drawing

Permuted alphabetical list

Teaching of architecture

Architecture
Fine Arts
Graphic Arts
Plastic Arts
Comic strips
Drawing
Technical drawing
Engraving
Fine arts
Graphic arts
Photography
Sculpture
Comic strips
Teaching of architecture
Technical drawing

Appendix 2. Examples of classifications

	Land- und Forstwirtschaft. Tierzucht. Jagd. Fischerei	Agriculture. Forestry. Stock- breeding. Hunting. Fisheries	Agriculture. Sylviculture. Zootechnie. Chasse. Pêche
63	Land- und Forstwirtschaft. Tierzucht. Jagd. Fischerei	Agriculture. Forestry. Stock- breeding. Hunting. Fisheries	Agriculture. Sylviculture. Zootechnie. Chasse. Pêche
631/635	Pflanzenbau. Forstwirtschaft	Plant husbandry. Forestry	Cultures végétales. Sylviculture
631	Allgemeine Fragen der Landwirt- schaft	Agriculture, farming in general Agronomy	Agronomie générale
631.1	Landwirtschaftliche Betriebslehre	Farm management	Science de l'exploitation agricole
.16	Buchführung. Schätzung. Taxation	Accountancy, costing, valuation	Comptabilité. Evaluation. Taxation
631.2	Landwirtschaftliche Gebäude	Farms and farmyards	Bâtiments agricoles
631.3	Landwirtschaftliche Maschinen und Geräte	Agricultural implements, tools and machinery	Équipement et machines agricoles
631.31	Bodenbearbeitungsgeräte und -maschinen	Soil working and tilling equipment	Appareils et machines pour le travail du sol
.311	Allgemeine Maschinen und Geräte	Implements for general use	Machines et outils en général
.312	Pflüge	Ploughs	Charrues
.313	Äggen	Harrows	Herzes et pulvérisateurs
.314	Walzen u. dgl.	Rollers, etc.	Rouleaux, etc.
.315	Cartongeräte	Garden tools: hoes, rakes, etc.	Outils de jardinage
.316	Kultivatoren. Grubber	Cultivators. Grubbers	Cultivateurs. Extirpateurs
.319	Sonstige Geräte. Pflanzgeräte	Drillploughs and other implements	Autres outils pour la préparation du sol
631.35	Sämaschinen. Düngestreuer	Sowing machines. Manure spreaders	Semoirs. Distributeurs d'engrais
.331	Sämaschinen	Sowing implements and machines	Semoirs
.332	Pflanzmaschinen. Umpflanzmaschinen	Planting tools and equipment	Planteurs. Machines à planter
.333	Düngestreuer. Düngungsmaschinen	Manure spreaders	Distributeurs d'engrais
.334	Sämaschinen mit Düngestreuern ver- bunden	Combined sower-manure spreaders	Semoirs-distributeurs d'engrais com- binés
.335	Geräte für Vermehrung von Pflanzen durch Ablager, Pfropfreiser usw.	Plant dividing and layering imple- ments	Outils pour la multiplication des plantes par marcottage, greffe, etc.
.336	Geräte zum Verpflanzen von Bäumen	Transplanters	Transplanteurs
.336.6	Geräte zum Verpflanzen von Bäumen	Tree planters	Transplanteurs d'arbres
631.34	Geräte zur Pflege und zum Schutz von Pflanzen. Stützvorrichtungen. Beregnungsvorrichtungen usw.	Implements for care, pruning, etc., supporting, protective, marking and spraying devices	Équipement pour les soins aux plan- tes; protection, soutien, réceptacles, arrosage, etc.
631.35	Erntegeräte. Erntemaschinen	Harvesting implements, machines	Outils et appareils de récolte
.351	Handgeräte. Sichel. Sense	Hand implements. Scythes. Sickles	Outils à main. Faucilles. Faux
.352	Mähmaschinen für Heuernte	Mowing machines	Faucheuses
.353	Sonstige Heuerntemaschinen. Heu- ladler	Haymaking machines. Hay loaders	Machines diverses pour la fenaison et la mise en meules
.354	Getreidemäher. Bindemäher. Mäh- drescher	Combine harvesters. Binders	Moissonneuses. Moissonneuses-lieuses.
.354.3	Kartoffel- und Rübenerntemaschinen	Potato, beet digging machines	Moissonneuses-batteuses
631.36	Geräte und Maschinen für die Auf- bereitung von Landbauerzeugnissen	Preparing, scouring, handling and dressing machines and equipment	Arracheuses de pommes de terre et de betteraves
.361	Dreschmaschinen für Getreide	Threshing, shelling, coring, peeling	Outils et machines pour la prépara- tion des produits agricoles
.362	Geräte und Maschinen zum Reinigen und Sortieren. Behälter. Siebe usw.	Sorting, sieving, cleaning, winnow- ing, washing, drying, fermenting	Batteuses, égrenneuses, dénoyautouses
.364	Vorrichtungen zum Bündeln, Binden und Pressen	Bagging, bundling, sheaving, baling	Outils et appareils pour le nettoyage, le calibrage, le séchage, etc.
			Bottleuses et presses

Hierarchical classification: excerpt from the main tables. From: *Universal Decimal Classification*, abridged trilingual edition, Berlin, 1958.

- Aggloméré, combustible 662.81
 matériaux de constructions 691.31
 de tourbe 674.88
 Agiotage, droit pénal 343.531
 Agitateur, instrument de laboratoire 542.23
 Agitation politique 323.2
 Agnation, coutume 392.35
 Agnosticisme, logique 165.73
 Agrandissement photographique 778.13
 Agriculture, assurance 368.5
 enseignement 373.68
 supérieur 378.938
 ministère 354.83
 questions générales 631
 réglementation 351.823.1
 Agronomie générale 631
 Agronomisation 338.922
 Agrumes, arboriculture 634.3
 Aide aux lecteurs 028
 économique entre états 341.232.3
 interétatique 341.232
 mutuelle, droit international 341.232
 sociale 361
 rurale 361.2
 urbaine 361.2
 technique entre Etats 341.232.5
 Aiguillage, voie ferrée 625.151
 Aiguille 672.82
 Ail, horticulture 635.26
 Aile volante, aéronautique 629.135.24
 Aimant, électricité 621.318.2
 Aimantation, magnétisme 538.24
 Air, adduction, bâtiment 697.92
 atmosphérique, technologie des gaz 661.92
 circulation dans les immeubles 697.95
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 humidité 551.57
 hygiène 614.7
 liquide, production 621.6.036
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 Ajustage, fabrication des calibres 621.753.2
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 Alcoylène, chimie organique 547.313
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 Aléaouse, machine outil 621.95
 Aléaouse-rodense, machine outil 621.954
 Algèbre 512
 Algérie (65)
 Algonkin, stratigraphie 551.72
 Algue, botanique 582.26
 brune, id. 582.272
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 marine, culture 639.64
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 solide, conservation 664
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 végétal, zootechnie 636.086
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 Alligator, animal de chasse 639.14
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 Allotropie, chimie pure 541.7
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 Allume-cigares 662.592
 Allumettes 662.53
 Allumeurs pour lampes 683.88
 Allumoïr électrique 662.593
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 Aloïne, chimie organique 547.991
 Alpes, division de lieu (234.3)

52. AGRICULTURE. FOOD.**520. General. Agricultural unrest.**

520/0. Agricultural production, agricultural products.

520/1. Agricultural policy.

520/11. Loans to agriculture.

520/2. Outlets for agricultural products F.O.R.M.A.

520/21. Associations of producers. S.I.C.A.

520/24. Integration of agriculture.

520/25. Agricultural exports and surpluses.

520/3. Town-country economic relations.

520/4. Agricultural organizations and associations.

520/41. F.N.S.E.A.

520/42. C.N.J.A.

520/43. Confédération Nationale de la Mutualité et du Crédit Agricole.

520/44. M.O.D.E.F.

520/45. M.A.R.F., others.

521. Activities.

521/1. Agrarian structures.

521/10. General (Price of land, F.A.S.A.S.A., etc.).

521/100. Land tenure: regulations and legislation.

521/101. Tenant farming, métayage and other types of farming.

521/102. Distribution of land.

521/103. Monographs.

521/11. Agrarian reform, redistribution of land. S.A.F.E.R.

521/12. Individual enterprises.

521/13. Collective enterprises: co-operatives, G.A.E.C., etc.

521/2. Farm management.

521/21. Economic calculation, production costs.

521/22. Agricultural bookkeeping.

521/3. Factors of agricultural productivity.

521/31. Farm equipment: mechanization, etc.

521/32. Natural factors, soil use and improvement.

521/33. Irrigation.

522. Cereals and fodder crops. O.N.J.C.

522/1. Wheat.

522/2. Rice.

522/3. Other cereals.

522/4. Fodder crops.

523. Other foodstuffs.

523/1. Fruits and vegetables, flowers.

523/2. Sugar, sugar-beet, sugar industry, sugar-cane.

523/3. Oil-seeds; vegetable fats.

523/4. Vines and wine, juices.

523/5. Alcohol. Alcohol regulations.

523/6. Stimulants.

523/61. Coffee.

523/62. Tea.

A special classification scheme for current political, economic and social affairs. A hierarchical classification. From: *Plan de classification*, Paris, Fondation Nationale des Sciences Politiques, Centre de Documentation Contemporaine, 1977.

CHAPTER J
AGRICULTURE
J0 Facets

<i>Facet</i>	<i>Term</i>	<i>(IN) by</i>
{P}	Plant	Enumeration and (AD)
{P} (Array 1)	Utility	Enumeration
{P} (Array 2)	Part	Enumeration
{P2}	Organ	Enumeration
{E}	Problem	Enumeration
{2P}	(1) Nature for 1 Soil of {E}	Enumeration
	(2) Substance for 2 Manure of {E}	Enumeration
	(3) Substance for 3 Propagation of {E}	Enumeration
	(4) Cause for 4 Disease of {E}	Enumeration
	(7) Material for 7 Harvesting of {E}	Enumeration
{2E} {3P}	Operation	Enumeration

J1 Plant Number

J1 The first significant digit of a Plant Number is **Utility Number**, the second is **Part Number**; the third is either **Genus Number** or **Species Number**, representing the botanical genus or species to which the plant belongs. If the third significant digit represents Genus, the fourth represents Species. The later digits of a Plant Number represent a Cultivar, which is the technical term for Cultivated Variety. These digits may be together called **Cultivar Number**.

J11 Utility Number

J11 The Utility Number is devised so as to give a favoured treatment to certain plants. It is true that a plant may be utilised for several purposes. But it is the primary purpose that should decide the Utility Number of a given

CHAPTER J		
AGRICULTURE		
J [P]: [E] [2P]: [2E]		
	<i>Foci in</i>	
	Utility Array of [P]	32
	1 Decoration	321
	2 Feed	33
	3 Food	331
	4 Stimulant	332
	5 Oil	333
	6 Drug	334
	7 Fabric	3391
	8 Dye. Tan	34
	91 Adhesive	341
	92 Manure	342
	93 Vegetable	346
	94 Sugar producing plant	35
	<i>Foci in</i>	
	Part Array of [P]	3511
	1 Sap	3512
	2 Bulb	3513
	3 Root	3521
	4 Stem	36
	5 Leaf	361
	6 Flower	37
	7 Fruit	371
	8 Seed	372
	97 Whole plant	373
	<i>Foci in [P]</i>	
	1 Horticulture	3731
	15 Foliage	374
	16 Floriculture	3751
	169 Bulb (Botanical)	3752
	16911 Lily	3755
	16912 Tulip	3759
	16913 Daffodil	37943
	197 Whole plant	3795
	2 Feed	38
	25 Leaf	381
	251 Grass	382
	3 Food	383
	31 Sap	384
	311 Sugarcane	385
		386
		387
		388
		389
		Bulb
		Onion
		Root
		Beetroot
		Turnip
		Carrot
		Radish
		Yam
		Stem
		Potato
		Elephant-yam
		Arrowroot
		Leaf
		Rhubarb
		Spinach
		Cabbage
		Lettuce
		Flower
		Cauliflower
		Fruit
		Apple
		Orange
		Musa
		Plantain
		Grape
		Mango
		Pineapple
		Date palm
		Fig
		Tomato
		Gourd
		Seed
		Rice
		Wheat
		Oat
		Rye
		Corn
		Barley
		Millet
		Pulse
		Nut

DESCRIPTORS

Note: The date appearing to the right of each Descriptor indicates the month and year that the term was entered into the ERIC system.

<p>ABBREVIATIONS Jan. 1969</p> <p>UF Acronyms</p> <p>RT Mnemonics</p> <p>Orthographic Symbols</p> <p>Stenography</p> <p>Writing</p> <p>ABILITY Jul. 1966</p> <p>UF High Ability</p> <p>Low Ability</p> <p>NT Academic Ability</p> <p>Cognitive Ability</p> <p>Language Ability</p> <p>Leadership</p> <p>Nonverbal Ability</p> <p>Skills</p> <p>Student Ability</p> <p>RT Ability Grouping</p> <p>Ability Identification</p> <p>Achievement</p> <p>Aspiration</p> <p>Complexity Level</p> <p>Gifted</p> <p>Handicapped</p> <p>Mechanical Skills</p> <p>Performance</p> <p>Productivity</p> <p>Readiness</p> <p>Slow Learners</p> <p>Talented Students</p> <p>ABILITY GROUPING Jul. 1966</p> <p>BT Homogeneous Grouping</p> <p>Student Grouping</p> <p>RT Ability</p> <p>Ability Identification</p> <p>Low Ability Students</p> <p>ABILITY IDENTIFICATION Jul. 1966</p> <p>BT Identification</p> <p>RT Ability</p> <p>Ability Grouping</p> <p>Critical Incidents Method</p> <p>Identification Tests</p> <p>Probationary Period</p> <p>ABLE STUDENTS Jul. 1966</p> <p>SN Ability to perform or absorb education at a specified level</p> <p>UF Capable Students</p> <p>BT Students</p> <p>RT Academic Ability</p> <p>Academic Achievement</p> <p>Advanced Students</p> <p>Average Students</p> <p>Gifted</p> <p>Superior Students</p> <p>Abnormal Psychology</p> <p>use PSYCHOPATHOLOGY</p>	<p>ABORTIONS Sep. 1970</p> <p>RT Illegitimate Births</p> <p>Medical Services</p> <p>Pregnancy</p> <p>Unwed Mothers</p> <p>Abreaction</p> <p>use CATHARSIS</p> <p>Absenteeism</p> <p>use ATTENDANCE</p> <p>Absolute Humidity</p> <p>use HUMIDITY</p> <p>Absolute Pressure</p> <p>use PRESSURE</p> <p>Abstract Bibliographies</p> <p>use ANNOTATED BIBLIOGRAPHIES</p> <p>ABSTRACTING Jul. 1966</p> <p>BT Library Technical Processes</p> <p>RT Abstracts</p> <p>Annotated Bibliographies</p> <p>Documentation</p> <p>Indexing</p> <p>Writing</p> <p>ABSTRACTION LEVELS Jul. 1966</p> <p>SN Levels of abstract reasoning reached in the process of developing successively broader generalizations reflected in language usage</p> <p>UF Levels Of Abstraction</p> <p>RT Abstraction Tests</p> <p>Abstract Reasoning</p> <p>Cognitive Processes</p> <p>Comprehension</p> <p>Conservation (Concept)</p> <p>Language Learning Levels</p> <p>Learning Processes</p> <p>Semantics</p> <p>ABSTRACTION TESTS Jul. 1966</p> <p>BT Psychological Tests</p> <p>RT Abstraction Levels</p> <p>Cognitive Tests</p> <p>Comparative Testing</p> <p>ABSTRACT REASONING Jul. 1966</p> <p>UF Space (Concepts)</p> <p>BT Thought Processes</p> <p>RT Abstraction Levels</p> <p>Generalization</p> <p>Logical Thinking</p> <p>Productive Thinking</p> <p>ABSTRACTS Jul. 1966</p> <p>BT Reference Materials</p> <p>RT Abstracting</p> <p>Annotated Bibliographies</p> <p>Documentation</p>	<p>Indexes (Locaters)</p> <p>Indexing</p> <p>ACADEMIC ABILITY Jul. 1966</p> <p>UF Scholastic Ability</p> <p>NT Academic Aptitude</p> <p>BT Ability</p> <p>RT Able Students</p> <p>Academic Achievement</p> <p>Academically Handicapped</p> <p>Academic Aspiration</p> <p>Average Students</p> <p>Cognitive Ability</p> <p>Intelligence</p> <p>Low Ability Students</p> <p>Student Ability</p> <p>Students</p> <p>Verbal Ability</p> <p>ACADEMIC ACHIEVEMENT Jul. 1966</p> <p>UF Academic Performance (Del Jun74)</p> <p>Academic Progress</p> <p>Academic Success</p> <p>Educational Achievement</p> <p>Educational Attainment</p> <p>Educational Level</p> <p>Scholastic Achievement</p> <p>Scholastic Performance</p> <p>School Achievement</p> <p>School Performance</p> <p>Student Achievement</p> <p>Student Performance</p> <p>NT Academic Failure</p> <p>Student Promotion</p> <p>BT Achievement</p> <p>RT Able Students</p> <p>Academic Ability</p> <p>Academic Aptitude</p> <p>Academic Aspiration</p> <p>Academic Probation</p> <p>Academic Records</p> <p>Academic Standards</p> <p>Achievement Rating</p> <p>Advanced Placement</p> <p>Degree Requirements</p> <p>Educational Accountability</p> <p>Educational Assessment</p> <p>Gifted</p> <p>Grades (Scholastic)</p> <p>High Achievers</p> <p>Intelligence</p> <p>Learning Difficulties</p> <p>Low Achievers</p> <p>Performance</p> <p>Performance Contracts</p> <p>Progressive Retardation</p> <p>Reading Achievement</p> <p>Student Evaluation</p> <p>Students</p> <p>Superior Students</p> <p>Underachievers</p>
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ERIC Thesaurus. Excerpt from text of descriptors, with indication of semantic relations. From: *Thesaurus of ERIC Descriptors*, 6th ed., p. 153.

8 Classification

Classification is a contents description which determines the main subject of a document and possibly one or two secondary subjects and expresses them by the most appropriate term in the documentary language employed. The usual type of classification shows the terms as numbers, but some utilize the generic terms of a combinatory language, for example, the names of semantic fields or the groups of a descriptor list or thesaurus (see Chapter 7).

For queries, the same method is followed to identify the classes and subclasses of the classification in which the relevant information for an answer has been filed.

Classification takes place in the middle of the documentary chain, either when the documents are entered into the storage and retrieval subsystem or when they are identified in the course of search operations.

Purpose

The purpose of classification is to facilitate: (a) the shelving of primary documents, where a systematic shelving plan is utilized; (b) the filing of bibliographic records in systematic files; (c) the inclusion of bibliographic records or references in printed catalogues or documentary products (bibliographic bulletins, abstract bulletins).

The benefits of classification are: (a) the possibility of aligning the physical shelving of documents with file arrangement, thus making it easier to use the collections, especially in cases of direct access; (b) that information can be broken down into relatively few categories, each of which can correspond to a subject field of special interest to a particular group of users; the class 'plant production', for example, could contain the subclasses 'cereals', 'vegetables' and 'fruits' within which users specialized in any of these areas would find all the relevant information; (c) information can be classified in advance by main subject area into a series of logically defined categories.

Access in this way is straightforward, quick and concentrated but less flexible

and precise than access via descriptors. Accordingly, information units quite often use a contents description in conjunction with a combinatory documentary language.

Procedures

Classification procedures follow the general pattern of contents description and include the following main steps:

Identification of the document's main subject.

Determination of the class to which the main subject belongs.

Identification of secondary formal characteristics (place, time, form, language) if the classification's numbering system includes this information.

Search for the numbers corresponding to the class selected.

Attribution or selection of the corresponding number in accordance with the rules of the classification system used.

Possible attribution of a call number which, in some systems, embraces the classification number, the first three letters of the author's name and the year of publication. For example, a document by R. Duchemin on the use of conifers for reforestation in France would have, in UDC, the following call number:

Forestry	classified as	634.0
in France [common subdivision of place]	classified as	(44)
Duchemin R.	classified as	DUC
that is	634.0 (44) DUC	

Marking of the call number on the document.

Marking of the classification number on the input sheet or bibliographic record, in the space provided.

The clues to a document's main subject are in most cases clearly visible. The title will normally be enough, but its appositeness should be checked against the table of contents, the main subdivisions of the text or even the text itself. Sometimes the title of the collection or series will confirm the document's theme and clarify the point of view or discipline with which it is concerned. Book jackets often contain a brief presentation of the work or a significant excerpt but, as they are designed mainly to attract attention, they may or may not provide helpful information.

An abstract, foreword or introduction often gives a quick indication of the essential aspects of the document, and the same can be said for the table of contents or subtitles which give order to the text. There is in fact usually no need to examine the whole document in detail.

Identification of the main subject

Identification does not, as a rule, call for specialized knowledge of the field in question, though this is always an advantage. Neither is it necessary to read right through the document, unless something has to be checked. In many cases, however, the main subject cannot be expressed by a single series of terms: the author may deal with several different aspects of his field, obliging a decision to be made on their relative importance and relation to each other. For example, the document mentioned above might devote equal attention to the various species of conifer employed, their growth-rate and resistance to disease, their economic advantages and correct planting methods, whereas the title points to only the first and last topic.

The problem, then, is to determine what a document is actually about by delimiting its outline rather than by concentrating immediately on identifying the central theme. The subject field should be specified in relation to the unit's particular interests, with the result that certain topics might have to be discarded, reordered or designated by more general terms.

The main subject of the document can now be expressed by a judicious combination of selected terms. The formulation may consist of a single term or a group of terms extracted directly from the document or inferred from the formulation. Thus, in our example, the four topics are expressed by the generic term 'forestry'.

Selection of classification numbers

Selection of the Corresponding Classification Numbers is rather like an exercise in translation. The easiest case is when the term chosen to represent the main subject of the document is itself included in the classification employed. It may be worth checking in the systematic tables that the descriptor in question is actually employed in a sense that corresponds to the topics covered by the document, since it may well be included in the classification system but in a class or group that narrows its meaning to certain aspects. For example, if the descriptor 'building' belonged to the class 'construction' in company with 'bridge', 'road', etc., this would suggest that these objects are considered as physical entities and that 'building', therefore, would not be appropriate for a document dealing with utilization, such as one on the advantages of residential buildings. This leads to the next possibility: as often happens, the term selected is not in the classification and it is a matter of deciding which descriptor is the closest. This requires a good knowledge or at least a good understanding of the subject field, though dictionaries, encyclopedias and handbooks can be of assistance. The systematic tables are consulted to find the most appropriate descriptor. In our example, for instance, the classification might contain a descriptor 'tree' in the 'plants' class and another one, 'forestry', in the

'agriculture' class. Clearly the latter is closer to the general theme of the document and the purpose it will probably serve.

If we imagine the field covered by the descriptor, by the main subject of the document and by its foreseeable use as three circles, the selected descriptor should ensure that they overlap as far as possible.

Verification of the selected descriptor in relation to the document is essential. One must be certain that it reflects as accurately as possible, allowing for the specific limitations of the documentary language and system, the main subject of the document in question. In particular, the classification should not introduce concepts that the document does not contain or considers of minor importance. At the same time, the designation must be precise, i.e. it must not use descriptors that are too general or too specific; it will be selected principally in terms of user needs by asking under what heading users would normally expect to find the document they want. This second verification is carried out by examining the document itself.

The use of general headings is convenient—even essential in some cases—but dangerous, so that it must be subject to strict rules. Generally speaking, classifications and other documentary languages include entries headed 'generalities', 'other', etc., within each class. These must only be used with good reason; in most cases, they are reserved for documents that cannot be satisfactorily described by any specific descriptor, or for documents dealing with several specific subjects and which it would be misleading to classify under any one of them.

Classification by secondary subjects is sometimes allowed by the documentation system though it is usually restricted to one or two entries in addition to the main descriptor. The procedure is the same as for the main subject, described above. Though both operations can be carried out at the same time, it is preferable to start by determining the main subject, then the secondary subjects before proceeding to select and check the corresponding descriptors.

Two types of secondary subject are admissible. One is when the document covers two or three equally important subjects: the one of most interest for the users is then treated as the main subject and the others as secondary subjects. As the four topics in our example—species of conifer, growth-rate and resistance to disease, economic value and planting techniques—are given equal treatment in the document, an information unit for botanists would choose one of the first two topics or their combination as the main subject, whereas one for ecologists would take the last topic.

The second situation is when a document does in fact have a main subject but it would seem equally useful for the classification to bring out one or two particular aspects of it, either because a great deal of attention is paid to them or because they would be of special interest to the users. This approach has the advantage of cutting down reliance on the 'generalities' headings and facilitating more direct—that is, less general—access to the information.

Secondary subjects are verified at two levels: first, of course, like the main subject, in relation to the document, and then in relation to the main subject.

Secondary subjects must clearly represent a particular aspect of the document that can be distinguished from the others, and this aspect must be of specific interest to the users independently of the main subject. Thirdly, the secondary subject must not be more or less contained in the main subject, particularly in the mind of the user seeking information on both of them. For example, the forester might well regard growth, resistance to disease and economic value as intimately linked to the species of conifer, but this is unlikely to be the view of an economist or planner.

Reclassification involves classifying documents already entered in one classification into another. This often happens when information units themselves using a special classification, receive bibliographic records classified according to a general one (D.C. or Library of Congress, for instance) or when a unit changes its system of classification.

The procedure is rather like that of selecting classification numbers on the basis of the terms chosen to describe the main subject. Unless there exists a concordance table linking the two classifications, it is necessary to refer to the original document or at least to an abstract. But even with a concordance table, it is always desirable to be able to check back to the original document. The source classification often has more general entries than the target classification and/or is based on different ordering criteria. The two systematic tables must therefore be compared to be certain of the exact field covered by each descriptor. Every effort must be made to safeguard logical consistency between the descriptors of the two classifications. A somewhat similar problem arises when contents description is carried out using a classification for the main subject and a combinatory language for indexing, whereas search may be focused on the description as a whole.

Title enrichment is an elementary operation of contents description, used when the title of the document, employed as a means of identifying documents or signalling their existence in dissemination products, is not significant enough in its original form. Even in scientific publications, titles sometimes stress one aspect of a document: in our example, the document entitled 'The Use of Conifers for Reafforestation' could have concentrated on the economic advantages of these species, in which case the title should have been 'The Economic Advantages of Planting Conifers', or it could have yielded to a desire for publicity (a title to catch the eye) or for polemical discussion ('A Revolution in Reafforestation'). Some titles are very vague or general ('Recent Trends in Reafforestation'). If the title is to be used as a tool for the selection of documents, it has to be enriched whenever it seems to express very little. The content is first rapidly described so as to produce an accurate statement of the subject; then terms are identified for adding to the original title to clarify the main subject of the document. These terms are added in brackets after the original title. In some cases (e.g. express information bulletins), completely new titles may even be coined. As for the document we have been using for purposes of illustration, we might have: 'A Revolution in Reafforestation (with Conifers, in France)'.

A similar procedure is sometimes followed even when the title is fairly significant, in order to add the discipline or general subject field, as in classification.

Check questionnaire

What is 'classification'?

What is the purpose of classification?

What information does classification provide concerning a document?

What differences should there be between a main classification and secondary classifications?

In what parts of a document can an indication of its main subject be most easily found?

Does the title of a document always express its main subject?

How is reclassification carried out?

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(See also the bibliography of Chapter 7.)

9 Indexing

Indexing is a form of contents description involving selection of the most appropriate terms to represent the contents of a document. These terms are taken from the vocabulary of the documentary language and are ordered to facilitate construction of the files to be used in searching. This makes indexing the central operation of any documentation system for information storage and retrieval. It usually takes place in the middle of the documentary chain, either when the documents are entered into the information storage-and-retrieval subsystem or at the searching stage, since queries have to be worded so as to permit comparison with the terms used for the documents in order to ascertain what documents will supply the answer. Indexing, however, can also take place during production, if the primary document is voluminous enough. In this case, the author, or a specialist, establishes a list of the subjects covered by the document and indicates the page or pages on which each one is dealt with.

The products of indexing are indexes, i.e. lists of significant terms. They may be contained in the primary document, usually at the end, or printed in current or occasional secondary publications. They can also be incorporated into manual or machine-readable files with a view to selecting documents according to the subjects with which they deal. In either case, indexes serve to select and retrieve information for the benefit of users.

The level of indexing depends on the needs and possibilities of the information unit. Indexing may cover only the main subjects: this is called generic indexing and it has much in common with classification except that it usually involves multiple references—i.e. it identifies a number of subjects—whereas a classification is generally unique in that it focuses on the main subject of a document. In most cases, indexing covers all the subjects treated in the document but identifies them by means of relatively general terms; this is called medium-level indexing and it can include up to about ten descriptors. In-depth indexing takes in all the subjects and describes them quite precisely with a larger number of descriptors. Lastly, exhaustive indexing, which goes through the entire text almost sentence by sentence, is primarily used for documents which are consulted in great detail (court decisions, for instance). As with all contents descriptions, indexing can be selective, that is, it

retains from the document only such information as is likely to interest the users of a particular information unit.

The characteristics of the information system have a powerful influence on indexing. In theory, the quest for precision and exhaustive coverage can be carried to great lengths when describing the subjects dealt with by a document, to the extent of making the index a kind of standardized reformulation of the document as a whole. Even if the means to do this should be available, however, there would be no point in it: like all information activities, indexing is first and foremost a tool designed to retrieve useful information for clearly defined categories of user with specific tasks to perform. The level of indexing must therefore be fixed so as to meet their needs at the lowest possible cost.

Apart from this, the choice of indexing level and procedures is affected by the size and qualification of the staff, the kind and amount of information to be processed, the information storage-and-retrieval system in use, the nature and material form of the products and dissemination services, and available financial resources.

The personnel concerned with indexing should have specialist knowledge of the field in question though its extent can depend on the level of indexing: the greater the precision required the more a satisfactory result will depend on a thorough knowledge of the subject. This is even truer for the indexing of queries since it is essential to grasp exactly what the user wants and what he wishes to do with the information once he has obtained it.

Procedures

Indexing procedures take different forms. Indexing can be done in a single operation following on from bibliographic description and by the same person—who would then have handled the whole of the intellectual processing—or by another person. It can be performed in successive stages by several people each of whom would be responsible for a particular task (extraction of terms, formulation in the documentary language, verification) or level (if indexing is required at the generic level, the medium level and the in-depth level, for example).

Alternatively, the entire job can be carried out by one person and then systematically checked by someone with more experience, or divided out among several people. In this case, the results would be compared and integrated into the final description to ensure as consistent and reliable an outcome as possible. This latter approach is only used for control purposes or in the case of highly sophisticated systems.

Whatever the procedure, there is always a stage of systematic collective verification, at least of a proportion of the indexed documents.

Indexing aids include the structure of the formats and the layout of the input sheets. Many systems take care to update guides and manuals that explain the procedures to be followed, give writing rules and provide examples of the most

typical cases, the main difficulties and correct solutions. This makes it possible to prepare analysis grids for the different types of documents and subjects that list the descriptive elements wanted. Indexing can also be computer-assisted, either for handling the documentary language—in which case the computer is programmed to indicate the descriptors selected to represent certain terms of the natural language, the descriptors relating to a given topic, the number of documents already indexed with a particular descriptor and so forth—or for handling the extraction of significant concepts based on the title or abstract, or even the text, in accordance with certain techniques used in automatic indexing. When indexing is carried out with a hierarchical language, the computer is often used for automatically posting descriptors of a higher or associated level to which the specific descriptors mentioned by the indexer relate. It can also be used with any type of documentary language to check the existence and correctness of a descriptor.

Indexing operations follow the same general pattern as for contents description, outlined in Chapter 6, and include the following main steps:

A reminder, if necessary, of the objectives of the operation.

Initial acquaintance with the document.

Identification of the main subject.

Identification of the elements to be described, and extraction of the corresponding terms.

Verification of the relevance of these terms.

Where necessary, conversion of the terms from natural language into the corresponding terms of the documentary language.

Verification of the relevance of this description.

Arrangement of the description to conform with any formal rules of presentation or expression required by the system.

If the indexing has to be at several levels, the process can either be repeated for each level or each step carried out at all levels. Indexing can be based on the title if it is significant, though this will produce few descriptors, most of them general. An abstract, if well done, can supply most of the material needed for indexing and save much time, but it is always desirable to be able to check the accuracy of the description against the full text. In-depth indexing or indexing based on highly specific criteria can only be done from the original document. As a general rule, it is always preferable to index from the document itself.

The first step is to glance through the document to determine its nature and purpose. This might well be obvious from its form: a thesis, for example, sets out the findings of some scientific research and should normally contain new knowledge, whereas a booklet aimed at the general public will explain in simple language, and often from a practical point of view, the main aspects of present knowledge on a subject. It is important to characterize the document or query at once, i.e. to recognize its purpose and what it is about. If the bibliographic description cannot be used in the search process or does not contain this information, it has to be incorporated into the indexing as it is important for gauging the value of the document.

Whatever the level of indexing, it is necessary to define the main subject of the document, in other words, to specify the aspect of the discipline or branch of activity concerned. This will guide subsequent operations.

The next step is to examine the document more closely, adjusting the level of analysis to the level of indexing desired.

The extraction of significant terms should respect the structure of the document. It is also useful to note the relative importance attached to the various subjects. The aim is to arrive at as accurate an image as possible of the original document. In other words, the indexer should extract all the terms which might be needed for a full description of all concepts and objects covered by the document and likely to interest the users of a given information unit. He then bases his selection on these interests and on the possibilities of subsequent searching. He can do this immediately but it is better to wait until the next stage, especially for themes of doubtful usefulness. Those of no interest to the unit are, as the case may be, simply mentioned in very general terms or discarded. Conversely, topics of particular importance for users but only dealt with in passing, or very elementary data, can be signalled (for example, for a research paper, an information unit serving research workers would note the problem studied and the conclusions reached, but also the methodology, arrangement, sample used, etc.).

After selection, the various topics are sorted out. For example, a document may compare a number of fertilizers whose names will have been noted during analysis but which are of no interest to users; they are therefore replaced by a more general term such as 'fertilizer' or 'chemical fertilizer'. An experienced indexer would do this during the extraction process but it is wiser to keep the two stages separate.

The aim of indexing is to answer the questions a user might ask about the purpose of a document and how it can help him. These can be memorized under the following general headings: subject, approach, manner, time, place.

Subject points to the subjects or topics covered by the document or query, e.g. irrigation techniques, fertilizers, methods of cultivation, yields, etc.

Approach tells the indexer to state the way in which the subjects are presented or organized (for example, the study of an irrigation network or the calculation of water needs, etc.).

Manner tells him to clarify the context of the action, its causes, consequences or objectives (for example, the introduction of new crops, prolonged drought, etc.) and to mention certain practical means through which the action takes place (such as spray irrigation, the use of a model, etc.).

Time suggests that he states the date or period of the action, since this usually differs from that of the document itself.

Place draws attention to the location of the action, when a particular geographical area is concerned. In some cases, only the name of the country is needed but a lot of documents require greater precision, such as the province, village, district, agricultural area, etc.

The selected terms are almost always **translated into the documentary**

language, at least for indexing carried out in information units. Indeed, the term indexing is sometimes used for this phase alone.

When indexing is done during production of the primary document, the problem of finding the same information from different documents under the same heading does not arise: the indexer simply draws up a list of all the useful and significant terms found in the text and arranges them, either in full alphabetical order or by themes (or groups) whose various aspects are indicated by more specific terms arranged in alphabetical order. The same applies for an information unit working in free text.

When a documentary language—of any kind—is employed, the indexer will be confronted with various types of situation.

First, a term extracted from the document may exist as such in the documentary language. This can be checked by means of the latter's alphabetical list. It can then be transcribed but the indexer, unless he is perfectly familiar with the documentary language, would be advised to check in its systematic part or by considering the indicated relations that the term is in fact employed with the same meaning. If not, he should proceed as in the third situation below.

Second, a term appears in the documentary language but with a cross-reference to another term selected as a descriptor; it is the latter term that should be used.

Third, a term is not included in the documentary language. In this case, the indexer must decide to what category, group or class of terms it belongs, bearing in mind the ordering principle adopted for the documentary language. He then turns to the systematic part of the documentary language and looks for the closest descriptor. For example, the term 'spray irrigation' may not exist in the documentary language but there might be 'methods of irrigation' in the 'irrigated cultivation' group, and this descriptor should be used each time a particular technique is referred to. Another possibility is that no descriptor in the documentary language provides a truly satisfactory translation. In this case the usual solution is to choose the descriptor which is hierarchically closest or has the closest relations to the concept in question and at the same time propose the creation of a new descriptor.

Whatever the situation, the selected descriptor should be at the same level of specificity as the term extracted from the document or query or, if this is impossible, at the next level above.

Organization of descriptors: when the documentation system has developed writing rules or uses a syntax, the descriptors have to be organized accordingly. Sometimes, too, the system obliges indexers to mention its generic descriptors or corresponding related terms ('agricultural infrastructure' would be added to 'irrigation network', for example) in addition to the specific descriptors they have selected.

Where queries are concerned, the organization of descriptor obeys the rules of the search logic used. This generally leads the indexer to build up sets of descriptors which progressively clarify, complement or exclude one another as the search proceeds (see Chapter 14).

The verification stage ensures that the indexing has been done properly

and in conformity with the particular rules of the system. The indexer—and sometimes his supervisor—always checks the result at least once. He must make sure that the formal writing rules have been respected, that the descriptors used do in fact exist and that they are spelt correctly. The quality of indexing can be gauged from the following criteria:

Exhaustivity: all the themes, objects and concepts dealt with by the document are to be found in the index.

Selectivity: only information of interest to users has been selected.

Specificity: the description represents the contents of the document as accurately as possible and avoids over-general or over-precise descriptors where specific or less precise terms would be more appropriate.

Consistency: another indexer or a user would normally describe the same document, or documents on the same subject, in the same way.

The completed index can be checked by comparing it with the original document or with the initial set of terms extracted from it, by simulating a few questions to see whether they in fact retrieve the document, by looking for information on one of the subjects it deals with or, if necessary, by comparing the indexing of several similar documents.

Indexing of non-textual documents

This raises special problems because of the particular nature of these documents, the way they are consulted and the great variety of needs they are likely to meet. Sometimes, but not often, non-textual documents are accompanied by a fairly substantial explanatory text which can be used for indexing, but in most cases it is necessary to examine the document as a whole.

An audio-visual document utilizes several dimensions and generally evokes a different response—more emotional, for instance—than a written text. Let us say, for example, that a written document relates the presentation of a new model of tractor; a photograph of the same event would contain a certain amount of information which could appear in the text but not be satisfactorily described without taking the visual aspect into consideration. Are those present recognizable? Is the tractor standing still or moving, giving a demonstration in a field or in the factory where it was made? Answers to such questions will dictate how the photograph is used (for example, a picture taken in a field would be more suitable for illustrating the modernization of agriculture than one taken in a factory). A film of the event would contain various sequences showing the speeches and the different stages of the presentation with a sound-track of background noises (the tractor's engine) and words (people speaking and the voice of the commentator).

The first problem is therefore to determine the unit to be described (documentary unit) which should be at least the smallest visible or audible part that can be used on its own. Above this minimum, however, its size will depend on the expected

utilization (the user might want the photograph of a tractor, of a particular tractor, of a particular tractor in a field moving from left to right at dusk, and so forth).

The second problem is to describe the concepts and objects. What is the best balance to aim for and how refined should the description be in each case? In our example, the relevant concepts are farm implements, mechanization, new products, while the objects are the tractor, the field, the driver, the public, etc. Although the basic procedure is the same as for textual documents, more emphasis often has to be placed on formal characteristics. Analysis grids are needed to guide the work of the indexers and prevent them from going astray or suddenly jumping from one level to another (concepts/objects, whole/detail).

Automatic indexing

Automatic indexing is certainly a technique of the future, though it is not yet widely practised in spite of the many experiments being conducted in a number of countries.

The computer, fed with either the whole text or at least the title and author's abstract, uses various methods to identify the significant terms. It can, for example, be programmed to compare terms from the abstract with the descriptors of the documentary language. Every time one of these is found in an abstract, the document is indexed by the corresponding descriptor. This method is not very efficient, except in highly specialized fields where the natural language closely resembles the documentary language.

An alternative procedure is to make a statistical analysis of a sample of texts and determine the frequency with which words appear. The very few words which crop up again and again are regarded as non-significant; a second group of words that occurs less often is regarded as significant while a third group contains rarely encountered words which are considered as being too specific. On this basis, the computer can be programmed to select words of a given frequency for indexing. It is made to calculate the frequency of words appearing in the full text of documents or in sets of abstracts and then to extract those lying within the optimal range. These words are then used to index the documents in which they appear. Although this method too can only be applied to a particular subject field, it is more effective than the preceding one but has the weakness of considering each word in isolation: it reveals that a concept or object is present in the document but cannot specify its role.

There now exist syntactic methods in which the computer analyses sentences according to a grammar stored in its memory or at least allows for the relative positions of words (co-occurrence) in selecting those to be used for indexing. This technique somewhat resembles manual operations and is thus more satisfying, but harder to perfect.

All these methods can, of course, be combined. The problem with automatic indexing is that the computer has to be fed with the full text or abstracts, a long and

costly operation, but this difficulty will gradually be resolved as the automatic composition of texts comes into general use.

Although human beings are still better at adjusting to the many—and often subtle—variables which indexing must take into account, the techniques of producing computer programs have become sufficiently refined for us to perceive cases in which automatic indexing might well be more effective.

Check questionnaire

Where does indexing come in the documentary chain?

What is the purpose of indexing?

At what levels can indexing be carried out?

What is an analysis grid for?

What can a computer do to assist indexing?

What questions must indexing answer?

How does one ensure that the indexing is consistent?

What details of a picture are suitable for indexing?

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Appendix. Examples of indexing

Titre	TITRE ORIGINAL	
9.1.7		ARNEL-FORTREL SINGLE KNIT FOR CHILDREN'S SWEATWEAR
9.1.8		
9.1.9		
Titre	TITRE EN ALLEMAND	
9.1.10		ARNEL-FORTREL R-L MASCHENWAREN FÜR KINDERNACHTWARSCHEN
9.1.11		
9.1.12		
Titre	TITRE EN ANGLAIS	
9.1.13		
9.1.14		
9.1.15		
Titre	TITRE EN FRANÇAIS	
9.1.16		TRICOTS JERSEY EN ARNEL-FORTREL POUR VÊTEMENTS
9.1.17		DE NUIT D'ENFANTS
9.1.18		
Titre	RESUME	
9.1.19	Description	Development @ in USA, 1 blended yarn @ Polyester @ Triacetate
9.1.20	Description	1 @ Knitting, sleepwear, (children's wear
9.1.21	Description	1 @ Triacetate fiber, 1 fire resistant fiber
9.1.22	Description	1 Physical property & Mechanical property @ Ring Spinning /
9.1.23	Description	1 Spun yarn @ 80/20 and yarn @ fibers blend @ Triacetate @ Polyester
9.1.24	Description	1 Use of level 310 / FORTREL 410 @
9.1.25	Description	1 Recommendations @ Knitting & Finishing @ plain knitted fabric @
9.1.26	Description	1 @ Triacetate @ Polyester
9.1.27	Description	1 Scouring / Process & process, atmospheric Dyeing @ Process
9.1.28	Description	1 Laying, plain knitted fabric @ Triacetate @ Polyester
9.1.29	Description	1 Modification @ Dyeing Formulation, each case
9.1.30	Description	1 Description @ Package Dyeing / Process, @ Blended yarn @
9.1.31	Description	1 Triacetate @ Polyester
9.1.32	Description	1 Table @ difference
9.1.33	Description	1 Modification @ property, @ plain knitted fabric @ Triacetate
9.1.34	Description	1 @ Polyester
9.1.35	Description	1 Fire resistance testing @ Standard @ norm FF-3-71 @
9.1.36	Description	
9.1.37	Description	
9.1.38	Description	
9.1.39	Description	
9.1.40	Description	
9.1.41	Description	
9.1.42	Description	
9.1.43	Description	
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9.1.93	Description	
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9.1.95	Description	
9.1.96	Description	
9.1.97	Description	
9.1.98	Description	
9.1.99	Description	
9.1.100	Description	

Example of indexing input sheet: TITUS II.

74052/232

CREATION OF IN-PROCESS RECORDS

A

Status

E

RECORD TYPE

D

Bibliographical level

ip record number	
master record number	

Date of receipt			
Indexer			
Reviser			
Keyboarder			

004 # 004 #

008.02. Language code e n g 03. Country code n 04. Retrospective indicator 07. Nature and form of content code

08. Source code e d c 09. Date 1 1 9 7 6 10. Date 2 11. Date code 13. Security code #

03	77S0059
08	37
09	ED.76/CONF.807/23 → a ED.76/CONF.807/COL.12
12	Symposium on Educational Planning, Human Resources and Employment → p. Paris → d. 1976
24	Problems in education and employment in Norway
26	→ c. July 1979
30	→ a. 14 p.
44	Reports and studies (on educational policy and planning) → v. C.19
69	<education and employment> <educational system> <Norway> - <employment> <economic growth> <compulsory education> <adult education> <work experience programme> <practical studies> <apprenticeship> <recurrent education> <occupational qualification> <educational needs> <educational financing> <education and development>
70	Ride, Kjell

IMP/1610 (b)

Example of worksheet, Unesco.

10 Abstracting

Abstracting is an operation which offers two important advantages: first, it reduces considerably the amount of primary information, and, second, it lays emphasis on aspects of particular interest to users.

As documentary products, abstracts usually take the form of quite short texts either accompanying the original document or included in its surrogate. Like the other operations of contents description, abstracts can be prepared:

At the beginning of the documentary chain, that is, during production of the primary document (in which case the abstract is usually provided by the author).

In the middle of the chain, when the documents are entered into the information storage, retrieval and dissemination systems.

At the end of the chain, after the processing of a query, when the primary documents selected are abstracted in order to provide a more suitable response for the user (for example, an analytical bibliography supplied on request).

Abstracting serves three functions: (a) dissemination of information; (b) selection of information by the end user; (c) retrieval of information, especially in computerized information storage-and-retrieval systems.

The advent of the computer has made it possible to use abstracts either for extracting keywords for the storage of information or for comparing the terms they contain with those used in queries during search operations.

Types of abstract

The various types of abstract may be distinguished by:

Their length, which normally ranges from a few dozen to several hundred words, and occasionally over a thousand.

The amount of detail included by the indexer in summarizing the document: certain abstracts, known as indicative abstracts, simply provide a brief summary whereas others, known as informative abstracts, include a varying number of points likely to interest the user.

The inclusion or absence of judgements or critical analysis, which may amount to some form of evaluation of the document.

Whether the indexer deals with the whole document or only with aspects that are likely to interest the user (slanted abstract).

Whether the author of the abstract is the author of the original document (this is called an author's abstract) or some other person.

The language used, which may be a free natural language or a more or less formalized artificial (i.e. conventional language).

Author's abstracts are included with many primary documents, especially in the scientific field. It is in fact becoming more and more standard practice for authors to supply an abstract of their text at the time of publication since this saves much time and effort for the subsequent processing and utilization of the document. But as the preoccupations of the author can differ sharply from those of the information system registering his text, it is worth checking the relevance of an author's abstract before feeding it into a system.

Contents and procedures

The main contents of an abstract consists of a synthesis of the original document which, depending on what is possible in each case, indicates: (a) the subject or subjects dealt with; (b) the nature of the document (e.g. an essay or a report on the result of an experiment); (c) the aims of the work described; (d) the methods or type of methods employed; (e) the results obtained; (f) the author's outlook or conclusions; (g) the place, date and if necessary the circumstances of the work; and, (h) in the case of a critical abstract, an indication as to the relative importance of the document.

Perusal of the abstract should enable the user (a) to gather a sufficiently precise impression of the document, and (b) to decide whether or not he needs to refer to the original document. If he decides against, the abstract should supply his basic information needs in lieu of the document itself. This is particularly important for the abstracts of documents in a foreign language unfamiliar to the user.

The secondary contents of an abstract may include for the informative part, a more detailed description of the document's main points, a description of certain special aspects—even minor ones—of particular interest to users, notes on certain details such as methods, equipment, results, etc., especially if new, and an indication as to how the various subjects are handled. For the critical part, when there is one, a discussion of the various aspects of the document either in relation to current knowledge or in relation to certain recognized user preoccupations.

The stages in abstracting are the same as for contents description in general (see Chapter 6). If the abstract is prepared after classification and indexing, with processing operations following a logical order of increasing complexity, it should benefit from what has already been done. The opposite is also true for abstracts prepared beforehand in order to speed up the dissemination of information.

The terms should be extracted in an orderly fashion; put simply, this means choosing them by theme and in accordance with the information categories expected by the user. The primary document's order of the presentation and the relative importance it attaches to the different subjects covered are two of several pointers, but they need not necessarily be reflected in the abstract unless they are particularly significant (e.g. for a document entitled 'Growth and Protection of the Apricot Tree' three-quarters of which is concerned with growth).

The various themes of facets of the document should be identified when it is first characterized, i.e. during the initial glance through. The terms are not extracted separately but in sets, either in the form of sentences from the original text or by making up new sentences to show their relationship.

An abstract should possess the following qualities:

Concision: however long the abstract, care should be taken to avoid in particular all expressions or circumlocutions that can be replaced by single words, but this should not be done at the expense of precision.

Precision: the description must not be emptied of all meaning by the systematic use of very general terms and sentences which doubtless succeed in condensing the original text but could as easily apply to another. One should therefore use expressions that are as exact and specific as possible without exceeding the requested length.

Self-sufficiency: the description of the document should be complete in itself, fully understandable and not require reference to any other document.

Objectivity: there must be no personal interpretation or value judgement on the part of the person producing the abstract. The primary document must be described such as it is, bearing user needs in mind. In the case of a critical abstract, the factors on which the judgement is based should be made explicit. The worst fault of an abstract is to be without substance, in other words to be a mere paraphrase of the title or, in the case of informative abstracts, to be composed of all-purpose sentences like 'The author describes the methodology and results of a study on the use of low temperatures to preserve fruit'.

The language used for abstracts is usually that of the author of the primary document or that of the abstracting service. Sometimes, however, especially if the language is not very widespread, the abstract is produced simultaneously in a more widely used language.

Certain abstracts are now being produced by methods that permit their automatic translation into several languages (in the TITUS system, for instance).

Use of the first person must be avoided; phrasing should be clear, precise and neutral, and all terms readily understandable for users. This last rule is particularly important for abbreviations and symbols, and only those which have become established and are widely used should be authorized. The terms must not only be accurate but at all times genuinely meaningful.

The actual layout of abstracts usually has to respect strict rules since they are meant for inclusion in publications or for insertion into manual or computerized files. In addition to general standards, each service enforces special rules for length,

layout, composition and characters. If these are not respected the abstract cannot usually be introduced into the system.

Abstracts can be of several types: some utilize the descriptors attributed to the document at the indexing stage. These descriptors are linked to form sentences, with free words to join them up or clarify their meaning. Most abstracts of this type have to obey strict rules for composition: the descriptors are arranged according to their hierarchical level and the various levels or points of view required by the description. In another type of abstract designed for automatic analysis or translation, the order and arrangement of the terms within the sentences follow special predetermined rules. These abstracts are, so to speak, drafted in a special language which, though governed by its own logic and grammar, remains perfectly intelligible to anyone familiar with the natural languages utilized.

Problems related to particular types of document. Certain types of document possess specific fixed characteristics which the abstract has to take into consideration. In most cases, they contain a standard series of element sometimes in a predetermined order. These documents include research proposals and reports, technical reports, the minutes of meetings, periodical reports, bibliographies, critical reviews, statistical compendia and so forth. The circumstances in which they are produced are often an important criterion that the abstract should mention even if it is not explicitly stated in the document. It is also common for them to be linked to other similar or even quite different documents: for example, a synthesis report will be related to a report on the analysis of the raw data. The abstract should at least signal this relationship and if possible supply enough information on the other documents for evaluating the one in hand. If, in such documents, certain elements are mandatory and especially if they have to be presented in a fixed order (for example, in the case of a research proposal: hypotheses and definition of the problem, the present state of knowledge in the area concerned, equipment, methodology, workplan, results and applications), the abstract must include this information, if possible also in a fixed order for each type of document.

The author of the abstract may be the author of the primary document or, if not, a person specially entrusted with this task. To produce an accurate abstract of a document he must have a good knowledge of the subject in question, in other words have the necessary training and specialized experience.

Check questionnaire

What are the advantages and disadvantages of an author's abstract?

Can abstracting be done at the end of the documentary chain?

Would it be acceptable for an abstract to be based only on the title of the primary document with a few changes of style?

Can an abstract employ abbreviations outside the normal vocabulary of users in order to save space?

- Is it possible for an abstract to deal exclusively with a minor aspect of a document?
Who can draft an abstract?
In what style should a good abstract be written?

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Appendix. Example of an abstract of a document

Original title

J. G. Tschinkel and H. Tschinkel
Contribution to the conservation of ligneous fuels: performance and fuel-saving properties of four types of cooking stove. 21 pp.

Author's abstract

In several arid regions, the destruction of plant cover owing to the need for firewood and charcoal has reached alarming proportions and incited governments to encourage the use of gas and paraffin rather than ligneous fuels. To permit a rational choice of the most suitable type of cooking-stove for rural areas, four types of cooking-stove using burners were tested under laboratory conditions: (1) a pressurized paraffin stove, (2) and adjustable wick oil stove, (3) a fixed wick oil stove, (4) a propane or butane gas ring. The amount of fuel consumed, the maximum amount of heat produced, flame adjustability and actual performance were compared. The pressurized paraffin stove proved superior on almost all counts; although the gas ring produced a similar amount of heat, the pressurized paraffin stove is more economical owing to the high cost of propane gas in Tunisia.

Abstract composed of descriptors

Economy. Forest

Study on/Domestic economy/in/Rural areas/. Comparison of four types of stove for the/Cooking/of food, concluding in favour of the/Paraffin/stove.

Study contributing to the/Forest conservation/by avoiding the use of/Firewood/and hence the destruction of/Plant cover/.

Indicative abstract

Comparative study of the physical and fuel-saving properties of four types of oil and gas cooking-stove suitable for rural areas in Tunisia.

Informative abstract

Comparative study under laboratory conditions of a pressurized paraffin stove, an adjustable-wick oil-stove, a fixed-wick oil-stove and a propane or butane gas ring in regard to fuel-saving properties, maximum heat produced, flame adjustability and performance characteristics. Owing to the cost of propane gas in Tunisia, the pressurized paraffin stove is the most economical. Its performance is superior.

The use of this source of heat in rural areas would reduce destruction of the plant cover.

11 Catalogues and files

A catalogue is an ordered set of references or records used to register the items of a collection. There exist trade catalogues which list the products made and/or distributed by a company at a given moment in time but this chapter will deal only with information-unit catalogues, which list and describe primary documents and/or the unit's collection of data; in other words, those which are composed of bibliographic descriptions (see Chapter 5).

There are various types of catalogue, which can be distinguished according to the nature of the carrier employed (paper, cards, machine-readable carriers, etc.), the method of arrangement or what they contain. Most units use several types of catalogue at the same time.

With the development of computerization, catalogues are increasingly taking the form of machine-readable files, with the result that the term 'file' is tending to replace 'catalogue'.

Catalogues and files represent, so to speak, the information unit's memory or address book and so are of capital importance. Operations connected with user services and many administrative operations are based on the handling of catalogues.

Catalogues serve many purposes, e.g. (a) the identification of primary documents; (b) the location and retrieval of primary documents; (c) the retrieval of primary documents likely to supply the information needed by means of the author's name, the subject, the country, etc.; (d) the administration of a collection of documents, since they are always ready with detailed data on its composition.

Forms of catalogue

There are various forms of catalogue:

Manual catalogues, which are the traditional type and use registers, loose leaves or, in most cases, cards. The major information units also publish their catalogues in book form. When such catalogues were printed by traditional methods, they were often outdated by the time of publication. Today, computers have speeded up production and facilitated updating, and it is now common for the

information units to issue their catalogues each month with the aid of computers (with annual cumulations) in the form of computer printouts.

Semi-mechanized catalogues, which are made out on special cards and require devices for recording the data and for manual, electrical or optical selection, e.g. punched cards (see Chapter 12).

Computerized catalogues, which are recorded on computer readable carriers (punched cards, magnetic tapes or discs) and arranged as bibliographic files to be consulted through the computer.

Compilation

Catalogues are compiled from the bibliographic records. The bibliographic description and the contents description serve to produce a master record or main card. In manual catalogues, the master record is made out in as many copies as necessary, sometimes more than ten per document. For each catalogue, the descriptive element used for entry (author's name, country, subject, call number, etc.) is emphasized by underlining or by being repeated at the top of the record. Computer-produced manual catalogues reproduce the master record under each heading, as in a bibliography, though some give it only once in full, in the author catalogue or more usually in a chronological catalogue arranged by accession number. In this case, the entries under the various headings in the other catalogues mention only the accession number or entry number of the main catalogue (the other catalogues are therefore indexes).

In semi-mechanized catalogues, the master record is transcribed on a special card and the various catalogue headings are punched, notched or marked. This gives a single catalogue with multiple entries which, if the system does not permit reproduction of the master record, can be used for the master file, and for other files when the system makes it impossible or awkward to code the elements required. The other elements, especially the subject, are transcribed on special cards on which the numbers of the corresponding documents are marked. In computerized catalogues, the master record is used to create a master file and the various catalogues can then be compiled either by reproducing each master record or by recording its accession number under the relevant headings. Computers make it possible to reach the master file from any element of the record.

The content of catalogues: catalogues can be based on any element of the bibliographic record, including classification and indexing. In practice, however, only those that serve for the retrieval of information or the administration of collections and facilitate the user's access to information are produced. As compilation and especially maintenance involve considerable work, one cannot create them at will or maintain those that are seldom utilized or consulted by few people. Each information unit has to weigh up user needs and the nature of its collections before deciding what catalogues are required.

Generally speaking, an information unit will compile at least an author catalogue and a subject catalogue. The other most common types are topographical, geographic, and chronological catalogues.

Types of catalogue

The author catalogue arranges the records in alphabetical order according to the author's name. When there are more than three authors, or when the author is not given (anonymous documents), some systems file the records in the author catalogue according to the title. This catalogue usually includes secondary authors such as scientific editors, translators, illustrators, the authors of prefaces and so on, and covers both individual and corporate authors, though it is sometimes worth compiling a special catalogue for the latter.

In the case of pseudonyms or name changes, the author catalogue can provide cross-references. The main function of this catalogue is to answer two questions: Does the information unit possess a given document by a given author? Does the information unit possess documents by a stated author?

The subject catalogue arranges the records in alphabetical order of subject headings or descriptors based on the content of a document. Under each heading the records are arranged alphabetically (by author and/or title) or by accession number. There exist two kinds:

The alphabetical subject catalogue in which the entries are arranged one after the other in alphabetical order, as in a dictionary, with as many subject headings—and hence cards—as necessary. Cross-references are used to clarify or supplement certain entries and to guide the user towards subject headings connected with his field of interest. This catalogue serves: (a) to find the reference of a document of which only the subject is known; and (b) to discover what documents on a given subject are possessed by the information unit.

The systematic subject catalogue in which the records are arranged according to a predetermined classification scheme based on the name or number of a subject. This catalogue offers the same access points as the preceding type and, in addition: (a) shows the subjects covered by the information unit and the scope of the unit's collection in each case; (b) permits search by category of subject or related subject with less manipulation of the files; and (c) makes it possible to establish the stocklist of documents possessed.

The geographical catalogue lists the records by the country, administrative district or natural region (water catchments, geological regions, etc.) with which the documents are concerned. The entries can be arranged in alphabetical order or systematically, as in the case of subject entries, but the former method makes cross-references particularly necessary to cope with the many relations existing between geographical terms.

This catalogue serves for the same kind of inquiry as a subject catalogue but the search is based on geographical names. If necessary, a similar catalogue can be founded on the place of publication or printing.

The chronological catalogue presents the records by publication date, date of reception by the unit or by accession number, with the most recent document heading the list. This type of catalogue is often employed for the master file because it is easy to maintain. Its chief function is to identify documents by age and it is used in conjunction with the author or subject catalogue to satisfy queries such as 'Have you a recent document or a document not older than x years, on ... ?' Chronological files can also be combined with an alphabetical author file or even with other files if the document's date is vital. They can also be based on the date of publication or on the date of the information contained in the document (for historical collections). In this case, the entries are arranged by historical period from ancient to recent times or vice versa. Entries of this kind can also be used jointly with the subject file.

The title catalogue presents the records in alphabetical order of titles and serves to find documents whose title is known but not the author or exact subject. As documents with more than three authors, anthologies and collective works are filed first of all according to their titles, a title catalogue becomes worth while when such documents exceed a certain number.

The dictionary catalogue contains a single alphabetical listing of entries by author, title and subject. This type of single-access catalogue becomes increasingly difficult to handle as the size of the collection grows, and it is seldom used.

The synoptic catalogue is made up of cards on which a set of data elements can be seen at a single glance. These cards, which are fairly large, hold the master record and, on their upper edge, various entries provide information about the document (classification number, subject, date, etc.) in symbolic form by means of codes, colours or staples. The records are filed alphabetically by author or title or in chronological sequence and the other categories of data—not too many in number—can be seen at the same time.

The topographical catalogue (or shelf-list) arranges the records according to their position on the shelves, in other words by call number. This catalogue is essential for stock-taking: as each card represents a document it is easy to check that each document is in its right place. In direct-access libraries it helps users to find what they want and provides an immediate indication of the collection's scope, revealing at a glance the proportion of documents in each category of the classification or format used. Such a catalogue, however, is only worth the trouble if the collection is fairly large and if the documents are shelved in a special order which does not correspond to any of the information unit's other catalogues.

For information units with decentralized branches or for networks of information units, a form of topographical catalogue is utilized in which the records are filed according to the unit possessing the document and to facilitate interlibrary loan, indicate the call number or accession number.

Catalogues by type of document simplify the task of finding documents of a particular type, such as a patent, periodical or map. They are arranged by title or by accession number and are particularly useful in information units with a wide range of documents likely to be requested by specific type.

Catalogues of periodicals, on the other hand, are widely used, since not only must the unit have information on the periodicals themselves through their bibliographic record but it has to watch over the development of the collection and check that each issue has been received, both for administrative purposes and to satisfy user queries. There exist special cards for the control of periodicals, which carry the bibliographic description of the periodical, essential to identification, and serve to check in each issue and monitor the status of a collection at any time.

These cards are usually arranged, by alphabetical order of titles, in special cabinets commonly known by their trade-name 'Kardex' (see Chapter 12), a term that can also designate a periodicals file in general. The records of articles obtained from the analysis of periodicals can be filed in special catalogues by author, subject, etc., or incorporated in the general catalogues, sometimes with a distinctive sign (card of a different colour, coloured stickers).

Union catalogues combine the catalogues of several information units to cover a particular category of document or subject field. They are usually arranged by author and/or by title, with each entry mentioning the units that possess the document (and in some cases the call number). They are often issued as a book, which the units concerned co-operate in producing.

These catalogues are indispensable for co-ordination and exchange between units (shared acquisitions, interlibrary loan, etc.). The most common type is the union catalogue of periodicals, for example, *IPPEC*,¹ a catalogue listing the foreign periodicals received in France.

The arrangement of catalogues depends on their content and type, but all units will at least have either a numerical catalogue (by accession number, document number, classification number or call number) or an alphabetical one. Intercalation is the operation whereby the records of newly arrived and processed documents are filed in the catalogues. For this, it is essential to work out and keep to clear procedures since a misfiled card is as good as lost.

There are two kinds of alphabetical order:

Word by word; for example:

Doctrine
Document, administrative
Document, archive
Documentalist
Documentation

Letter by letter; for example:

Doctrine
Document
Document, administrative
Documentalist

1. *IPPEC* is an inventory of foreign periodicals and serials received in France by libraries and documentation centres. It is published and maintained by the French National Library in Paris.

Document, archive

Documentation.

The first method allows compounds to be grouped together.

Cross-references serve to direct the user from one entry to another that is related in some way. The more access points there are, the easier it is to use the catalogue, but maintenance becomes increasingly burdensome.

If, for example, a descriptive element contains the compound 'mathematical research', one could make out two entries—and hence two cards—one for 'mathematical research' and the other for 'research, mathematical'. To avoid the proliferation of cards and keep down the size of the catalogue and the amount of handling, a system of either technical or intellectual cross-references is utilized. Technical cross-references show the relation between a generic term and specific terms, and vice versa. For example: 'MATHEMATICAL RESEARCH see RESEARCH', or 'IVORY COAST DEMOGRAPHY see DEMOGRAPHY, IVORY COAST'.

Intellectual cross-references link an unusual term to the subject heading or descriptor with which it has been related (synonyms); for example: 'ONOMASTIC see PLACENAME'.

They are also used to guide users towards closely-related headings; for example: 'CANCER see also LEUKAEMIA'.

Depending on the narrowness of the subject, its intrinsic interest and the number of references under the heading, the records will be inscribed under only one heading (if these three factors are of little consequence) or under several.

Check questionnaire

What is a catalogue?

How is a catalogue produced?

What is the purpose of a union catalogue?

What are the different types of subject catalogue?

What are topographical catalogues used for?

What forms can catalogue take?

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Anglo-American Cataloging Rules. (North American text prepared by the American Library Association, the Library of Congress and the Canadian Library Association.) Chicago, ALA, 1967.

Anglo-American Cataloging Rules. (British text, prepared by the American Library Association, the Library of Congress, the Library Association and the Canadian Library Association.) London, The Library Association, 1967.

Cataloging, Coding and Statistics of Audio-visual Materials. Proceedings of the International Symposium Organized by ISO/TC 46 Doc, in Coll. with IFLA and IFTC, 7-9 January 1976, Strasbourg. Paris, Unesco, 1976.

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HORNER, John. *Special cataloguing.* London, Linnet Books/Bingley, 1973.

LAMY-ROUSSEAU, F. *Uniformisation des règles de catalogage des documents visuels et sonores; description d'une expérience.* Montreal, Ministère de l'Éducation du Québec, 1973.

SNOW, Kathleen. *Manual for Cataloging Non-book Materials.* Calgary, 1971.

Union Catalogue

BOUFFEZ, F.; GROUSSEAU, A. *Less publications en série et l'automatisation. Deux secteurs-clés: catalogues collectifs et gestion (bulletinage et réclamations) dans quelques pays anglo-saxons.* Paris, Cercle de la Librairie, 1977.

BRUMMEL, L. *Union Catalogues: Their Problems and Organization.* Paris, Unesco, 1956. (Unesco Bibliographical Handbooks, 6.)

WEHEFRITZ, E. V. (ed.) *International Loan Services and Union Catalogues. A Manual.* Frankfurt-am-Main, Klotermann, 1974.

WILLEMEN, S. *Technique of Union Catalogues: A Practical Guide. Unesco Bulletin for Libraries, Vol. XX, No. 1, 1966, pp. 2-23.*

(See also bibliography of Chapter 5.)

Appendix. Examples of catalogue cards

AUTHOR CATALOGUE

Cards may be established for added author entries.

Cote ROBERT (René), SALVAT (Robert).
 - La Réunion / texte, R. Robert, R. Salvat ;
 photographies, M. Folco. - apestes : Editions
 du Pacifique ; Paris : diffusion Hachette ,
 1976. - 128 p. ; ill. en noir et en coul.
 22 cm. - (Collection Iles)
 D.L. 77-0417a. - ISBN 2-85700-004-9 Rel.

Salvat (Robert).
 Folco (M.) Phot.
 Tourisme. La Réunion
 Indice du plan de classement

SUBJECT CATALOGUE

Tourisme. La Réunion
 Cote ROBERT (René), SALVAT (Robert).
 - La Réunion / texte, R. Robert, R. Salvat ;

TITLE CATALOGUE

Cote La Réunion / texte, R. Robert, R. Salvat ;

CLASSIFIED CATALOGUE

Cote ROBERT (René), SALVAT (Robert).
 - La Réunion / texte, R. Robert, R. Salvat ;

 Indice

TOPOGRAPHICAL CATALOGUE

La Réunion. Tourisme
 Cote ROBERT (René), SALVAT (Robert).
 - La Réunion / texte, R. Robert, R. Salvat ;

Examples of cards for different catalogues, established according to an entry in *Bibliographie de France*, Paris, Bibliothèque Nationale.

Author card
A single author
with indication
of subject headings.

8257. URI (Pierre).
— *L'Europe se gaspille: remise en question des données, des idées, des politiques* / Pierre Uri. — [Paris]: Hachette, 1973 (27-Mesnil-sur-l'Estree: impr. Firmin-Didot). — 357 p.; 23 cm. — (*Collection Les Grands rapports.*) [8° R. 75703 (4)
D. L. 25466-73. — Br.: 37 F.

Economie. Europe. 20e s. (mi-lieu).

Two authors.

77-11921. ROBERT (René). SALVAT (Robert).
— *La Réunion* / texte, R. Robert, R. Salvat; photographies, M. Folco. — Papete: Éditions du Pacifique; [Paris]: [diffusion Hachette], 1976 (impr. au Japon). — 128 p.: ill. en noir et en coul.; 22 cm. — (*Collection Iles*) [8° G. 20553 (10)
D.L. 77-04171. — ISBN 2-85700-004-9 Rel.: 48 F.

Anonymous.

77-11927. "Archéologie de l'Afrique antique: bibliographie des ouvrages parus en... / [publié par le] C.N.R.S. [Centre national de la recherche scientifique], Institut d'archéologie méditerranéenne. — Aix-en-Provence: C.R.A.M. [Centre de recherches sur l'Afrique méditerranéenne]: [puis] Institut d'archéologie méditerranéenne, [1967]->. — 27 puis 30 cm. [4° Q. 7156
Changement d'éditeur à partir de l'année 1969.
1976 / bibliographie... et complément des années antérieures réunis par Danièle Terrer.
— 1977 (13-Aix-en-Provence: Impr. de l'I.A.M.). — 42 p.
Index. — D.L. 77-12834. — ISBN 2-901667-03-1 Br.: h.c.

Examples of bibliographical entries serving as a basis for the various catalogues, *Bibliographie de la France*, Paris, Bibliothèque Nationale.

76-14865. *Analyse et modélisation de l'écoulement superficiel d'un bassin tropical : influence de la mise en culture. Côte d'Ivoire, Korhogo, 1962-1972 / H. Camus, P. Chaperon, G. Girard, M. Molinier. -- Paris : Office de la recherche scientifique et technique outre-mer, 1976 (Paris : Impr. COPÉDITH). -- II-II-81-184 p. : ill. ; 27 cm. -- (*Travaux et documents de l'O.R.S.T.O.M.* ; 52) [4° R. 12051 (52)]
 Bibliogr. p. 81. -- D.L. 76-15688. -- ISBN 2-7099-0407-1 Br. : 44 F.

Considered
as anonymous
(more than
three authors).

8934. *MICHEL (Pierre).

— *Les Bassins des Fleuves Sénégal et Gambie : étude géomorphologique...* / Pierre Michel,.... -- Paris : Office de la recherche scientifique et technique outre-mer, 1973. -- 3 vol. -- (*Mémoires / O.R.S.T.O.M.* ; 63.)
 Bibliogr. p. 689 à 723. -- D. L. 20201-20103-73. -- Br. : 200 F.

1. [Texte]. -- (21-Dijon : impr. Darantière). -- 365-[18] p. -[1] dépl. : ill. ; 27 cm. [4° R. 10733 (63, I)]
 2. [Texte]. -- (21-Dijon : impr. Darantière). -- P. 378 à 752-[20] p. : ill. ; 27 cm. [4° R. 10733 (63, II)]
 3. [Planches et cartes]. -- (Paris : Impr. du Bureau de recherches géologiques et minières). -- [16] dépl. en noir et en coul. ; 78 cm. [Gr. Fol. R. 179 (63)]
- Sénégal (fleuve) (Bassin), Géo- morphologie. -- Gambie (fleuve) (Bassin), Géo- morphologie.

A single author
(several volumes).

77-1459. *FRANCE. Plan (Commissariat général). *Commission Départements d'Outre-mer.*

— *Rapport de la Commission Départements d'Outre-mer / Commissariat général du plan.* -- Paris : la Documentation française, 1976 (42 Saint-Just-la-Pendue : impr. Chirat). -- 87 p. ; 24 cm. -- (*Préparation du 7^e plan.*) [8° Lf^{no}. 298 (44)]
 D.L. 76-29661. -- Br. : 15 FF.

Corporate author
relating to
a territory.

Corporate author:
state or government
agency or institution
(with subject headings).

- 8935. OFFICE DE LA RECHERCHE SCIENTIFIQUE ET TECHNIQUE
OUTRE-MER.** [Paris.] Centre de Nouméa.
— **Les Eaux du Pacifique occidental à 170° E entre 20° S et 4° N:** coupes et
cartes / dressées par les océanographes du Centre O.R.S.T.O.M. de Nouméa;
présentées par H. [Henri] Rotschi, Ph. [Philippe] Hisard et F. [François] Jarrige.
— Paris: Office de la recherche scientifique et technique outre-mer, 1972 (93-
Bondy: Impr. S.S.C.). — 113 p.: ill.; 27 cm. — (*Travaux et documents de l'O.R.
S.T.O.M.*; 19.) [4° R. 12651 (19)
Bibliogr. p. 21 à 24. — D. L. 7596-73. — Br.: 24 F.]
**Océanographie physique, Obser-
vations, Pacifique (sud), Méridien,
170° E. --** Pacifique (sud), Méridien,
170° E. Océanographie phy-
sique. Observations.

Corporate author
(international
organization).

- 77-1742. COMMUNAUTÉS EUROPÉENNES.** [Bruxelles.] Statistique (Office).
— **A.C.P. :** [Afrique, Caraïbes, Pacifique], annuaire des statistiques du commerce
extérieur : synthèse 1968-1973 / Office statistiques des Communautés européennes
= **A.C.P. :** [African, Caribbean, Pacific countries], yearbook of foreign trade statis-
tics : statistical abstracts : 1968-1973 / Statistical office of the European communities.
— Luxembourg : Office des publications officielles des Communautés européennes,
1975. — 95 p.; 21 x 30 cm. [4° Gw. 3387 (1973)
D.L. 77-01791. — Br. : 13,50 DM : 1,20 £ : 24,70 FF.]

77-444. CONFÉRENCE INTERGOUVERNEMENTALE.

- [1975, 25 octobre-6 novembre. Accra.]
— **Rapport final /** Conférence intergouvernementale sur les politiques culturelles
en Afrique organisée par l'Unesco avec la coopération de l'O.U.A. [Organisation
de l'Unité africaine], Accra, 27 octobre-6 novembre 1975. — Paris : Unesco. [1976].
— 107 p.; 30 cm. — (*SHC-MD*; 29.) [4° Gw. 3255 (1975)
1976 d'après le texte. — Index. — D. L. 76-18770. — Br.]

Catalogue card
(for a conference).

79-51. *COLLOQUE INTERNATIONAL UNITÉS ET MONNAIES DE COMPTE.

[1977. Paris]

- Unités et monnaies de compte : travaux / du Colloque international, Paris, 24-25 octobre 1977 ; or ganisé par Jean-Louis Guglielmi, ... Marie Lavigne, ... - Paris : Economica, 1978 (Paris : impr. Jouve). - XIII-139 p. : graph. ; 24 cm. - (*Recherches Panthéon-Sorbonne : Série Sciences économiques : Études internationales.*) [8° R. 81456 (2)]

Notes bibliogr. - Textes en français et en anglais. - D.L. 78-19499. - ISBN 2-7178-0122-7 Br. : 50 F.

Catalogue card
(for a conference).

77-11931. BARBOU (Alfred).

- Histoire de la guerre au Dahomey / par Alfred Barbou. - Paris : Bibliothèque nationale, 1977 (Paris : photo Bibliothèque nationale). - 2 microfiches acétate de 49 images, diazoïques : ill. ; 105 x 148 mm. Impr. [Microfiche m. 7043
Reprod. de l'éd. de Paris, J. Pégat, 1893, 154 p., [4° Lh⁴, 1914. - D.L. Mc. 77-0145. - 20 F.

Catalogue card
(for a microfiche).

77-294. MONDE. Atlas. 1976. — Atlas général Larousse. Avec la collaboration de Harold Fullard... H.C. Darby... direction et coordination Georges Reynaud-Dulaurier... [Nouvelle édition mise à jour]. — Paris, Librairie Larousse, 1976. — 30 cm, 184 cartes en coul., index 128 p. [D.L. 877, 1976.] [Ge. EE. 2096
Notice jointe 19 p. ; Atlas général Larousse... Statistiques...]

Catalogue card
(for an atlas).

77-290.*MATAM-KIDIRA (Région). Sols. 1976. — République du Sénégal. Office de la recherche scientifique et technique Outre-Mer. Centre de Dakar. Étude des pâturages naturels du Ferlo-Boundou. Carte pédologique de reconnaissance de la zone Matam-Bakel-Kidira. Dressée par C. Feller et P. Mercky 1 : 200 000. — (Paris.) O.R.S.T.O.M., 1976. 1 file en bistre et noir 725 × 785. [D.L. imp. 530, 1976.] [Ge. B. 12613]

Catalogue card
(for a map).

77-3990.*Bulletin d'information - Centre de documentation et de recherches bibliographiques / Université des langues et lettres de Grenoble. — Grenoble ([domaine universitaire de Saint-Martin-d'Hères], 38040 cedex) : Université des langues et lettres de Grenoble, C.D.R.B., 1977 mars (n° 29) — . — 30 cm. [4° Jo. 19717
Trimestriel. — Fait suite à : « Bulletin d'information du Centre de documentation et de recherches bibliographiques », même ISSN, même coté, dont la publication avait été suspendue en 1971. — D.L.F. 77-0931. — 01.
ISSN 0017-4149

Catalogue card
(for a periodical)
with an indication
of change of title.

12 Facilities and equipment

The facilities of an information unit include the premises, the internal arrangement and basic installations (lighting, electricity, water, heating, safety devices, etc.), furniture, various types of equipment and apparatus for shelving and storage, information retrieval, printing, reprography, microcopying, telecommunication, means of transport, and the exploitation of audio-visual documents. A unit's facilities and equipment greatly influence the way it is run and its relations with users and the outside world.

Each type of unit should be laid out in an appropriate manner and each operation calls for the appropriate equipment. As the selection, installation and maintenance of all these facilities is a rather complicated and costly business, it should be guided by a general plan and by detailed analysis of the work to be performed.

The preliminary study or 'programme' should be established by a team composed of the unit's director, architect, staff and, if possible, users.

Programme concept

The programme should cover:

General considerations: financial resources; the site, available or required; the size and qualifications of the staff; the objective and functions of the unit; the consequent operations it will carry out; the users, user needs and information-seeking behaviour; existing infrastructure; nearby information facilities; advances in information technology;

Technical considerations. The programme should determine the optimal conditions for the utilization of space and equipment, the preservation of documents and the comfort of users and staff, by taking into account:

Climate. Excessive drought and excessive humidity are equally harmful. Air-conditioning appears to be the best solution, especially for tropical countries, but it is very costly in continuous use and ineffective otherwise, and has not yet become everywhere a part of social life. It can be at least partly replaced by

good insulation, an adequate volume of air, well-designed ventilation and careful attention to the use of space.

Lighting. Strong sun is bad for documents while artificial lighting can be very tiring and even psychologically distressing if used throughout the day. Certain documents such as microforms or transparencies, need subdued lighting for consultation. The various areas of the unit (for reading, staff desks, storage) do not have to have the same lighting.

Acoustics. Work areas must be separated from noisy areas (corridors, machines, the consultation of sound documents, etc.).

Special problems. The conservation and use of audio-visual documents and microforms, the weight of equipment, especially loaded bookshelves, sometimes call for the strengthening of floors.

Security arrangements. Fire prevention (use of fire-resistant materials; safety devices and extinguishers) waterproofing (water is more harmful for documents than fire), and precautions against parasites (use of fungicides or fumigation to protect the premises and its contents), dust (ventilation), theft (control of entrance and exit, special magnetic devices), and the wear and tear of documents (binding, systematic use of copies, etc.).

The selection criteria are based on an accurate assessment of these parameters. It is vital to plan not only for current needs but for future expansion at least five years ahead, and even ten years ahead for major items.

With respect to the building itself and its internal layout, the following should be aimed for:

The best possible solution to the specific needs of an information unit, in particular the technical ones.

Ease of access and/or communication for users (a well-placed site, good telecommunications, sufficient room).

Adequate and well-planned work areas for the staff (documents take up much space).

Enough storage capacity for the proper conservation of collections, allowing for future expansion.

As little moving about as possible.

Adequate technical facilities (lighting, power points, air-conditioning, telephones).

Ease of maintenance.

As for technical equipment, there are two dangers to avoid:

Overequipment, i.e. the acquisition of machines whose capacity is far greater than foreseeable needs (for example, a machine used for only a few hours per week or costing more to run than the use of locally recruited staff without a decisive gain in time) or which cannot be employed (for lack of skilled staff, appropriate apparatus or proper maintenance).

Under-equipment, i.e. the lack of essential apparatus and supplies, which prevents the unit from providing the services expected by users, causes excessive delays or results in inferior products (for example, a photocopier in poor condition or frequently out of action because the supply of paper has run out).

Selection and acquisition procedures should be based on a detailed functional list of requirements for each job covering all the duties involved and the equipment and supplies needed.

Manufacturers should be given a precise description of the equipment wanted, including type, specifications and the conditions under which it will be used. Estimates (description of the equipment or work together with price and delivery date) should be requested as a matter of course from all potential suppliers and the offers compared. Many countries make it compulsory to ask for tenders regarding which the application forms and conditions are fixed by regulations.

The material and equipment selected should be as follows:

Of good quality, i.e. likely to remain in good running order for a long time, even if more expensive. Economizing on the purchase price almost invariably increases the cost of servicing.

Easy to install and maintain.

One of the manufacturer's standard models so that spare parts, supplies and servicing will be obtainable throughout the normal life of the equipment.

Manufactured by a local firm or by one with a representative in the country, located as near the unit as possible and providing a quick and efficient after-sales service (servicing, repairs, spare parts, supplies and, if necessary, training courses for the unit's staff). This usually takes the form of a servicing contract with the supplier.

The equipment delivered should correspond to the specifications and be if possible a standard model or at least one that is widely employed in the country concerned. This is the best way of facilitating co-operation with other units and provides an additional safeguard with respect to servicing, since the local market will probably be big enough to ensure a good service by the manufacturer or his agent. It is an advantage if the design permits a certain flexibility in use: sealed equipment makes subsequent adaptation impossible.

Appearance, comfort and variety should not be disregarded when selecting fittings, equipment and furniture but are less important than robustness, practicality and safety.

It is sometimes possible to try out certain items of equipment, and it is a particularly good and useful idea to contact other users in order to check actual performance, working conditions and servicing.

Premises and furniture

The premises occupied by an information unit include three main areas of activity: (a) a public area; (b) a staff work area; and (c) a storage area. In addition, there must be enough room to move from one part of the unit to another. As there is always a great deal of movement, the smaller the staff the more carefully this problem has to be examined.

The relative size of each area depends on the nature and function of the unit. A library, for example, needs a lot of space for storage, whereas a referral centre might need very little.

The programme makes it possible to divide up and organize the available floor area on functional lines that will take probable future development and the equipment needed into consideration.

In an information unit, the staff generally need more room than in an ordinary office since they must have files, reference works, documents to be processed and various items of equipment close at hand. If they are not comfortably installed they will work less efficiently; here again, immediate economies will not pay off in the long term. Jobs involving the same operation or consecutive operations should be carried out near one another in order to facilitate supervision, make it easier for staff to work together and reduce the need to move about.

The storage area should be designed with the main emphasis on security. Access should be easy, and the area should be large enough to stock the documents as long as possible. An overcrowded storage area inevitably disrupts the unit's work.

The furniture of an information unit includes everything needed for office work (tables, chairs, armchairs, desks, side-tables, cupboards, trolleys, etc.) and for the accommodation of users (chairs, armchairs, work tables, low tables, display units and showcases, cloakrooms, etc.). It should be robust and if possible of modular construction, that is, consisting of a limited number of standard units that can be joined together on one side at least.

Equipment

The range of office equipment is still growing and includes typewriters, calculators, dictaphones, envelope-addressing machines and so on. Typewriters in particular should be of excellent quality so that the documents produced by the unit are easy to read; those with an interchangeable 'golf-ball' permitting the use of different types are particularly recommended.

Information units require a great many supplies such as cards, forms, registers, ink, rubber stamps, paper, pencils, etc., of which stocks should always be large enough to avoid the risk of having a job held up for lack of materials. In developing countries, particular care must be taken over this point as fresh supplies often take a long time to be delivered.

Storage equipment is needed for the various types of document as well as for their surrogates (cards). It should be robust, adaptable, extensible, compact i.e. take as little room as possible) and perfectly suited to its particular function.

The system of storage depends on the type of document, the amount of space available, the layout of the building, the size of the collection and how it is used. Where two alternative systems are feasible, the one that is most appropriate for the envisaged frequency and mode of consultation of the various primary and secondary documents should be chosen.

There exist many types of storage equipment, fixed or movable, static or capable of being rotated, and designed for the various sizes of document and different types of utilization: shelves, special cupboards for periodicals, maps, technical drawings, engravings, slides, films, magnetic tapes and dossiers, filing cabinets and so forth. The shelves, of standard dimensions, can be made of wood or metal and be fixed or movable and manually or electrically operated. Certain materials are specially treated to protect them against fire, heat or humidity and are good for the storage of fragile documents such as magnetic tapes, films, etc.

There are a great many models of card-file cabinets, in wood or metal, on the market. They can be permanently fixed or movable, with the cards in drawers, vertically arranged, rotating, on racks, attached to revolving drums and so forth, and they are designed for different sizes of card and different purposes. Some are manual while others are electrical or even electronic. Before choosing they should be tried out and compared.

Equipment for information storage and retrieval includes the above-mentioned manual card-file cabinets, electronic data-processing equipment (see Chapter 13), semi-mechanized devices and microform systems.

The semi-mechanized systems use stiff cards of various sizes (larger cards can hold more information), manual, mechanical or electrical card punches, manual, electrical or optical sorting devices and special cabinets for the size of card employed.

Marginally or centrally punched cards contain a zone for transcription of the bibliographic record and a coding zone for the punches. This system requires a code in which all the characteristic features of the document are represented by a punch or a combination of punches.

Marginal punched (or edge-notched) cards have numbered holes around their borders which serve for the code used to identify the characteristics of a document. The cards are appropriately notched for each type of document, i.e. certain of the holes are opened out to the border of the card. To sort out documents with the desired characteristic, a needle is pushed through the corresponding hole and the set of cards shaken. Only the cards that fall (the dropping fraction) correspond to the document wanted.

A basically similar method is to have cards, without pre-punched holes, on the borders of which the coding system is transcribed. The cards are then punched and notched later, during the input operations. This method is mainly used for small collections, because selection takes a long time (one has to go through the cards as many times as there are search characteristics and the needle can only be pushed through a fairly thin set of cards). Other practical drawbacks are that cards wear out very quickly if used repeatedly and notches can be formed by accident.

Centrally punched cards contain a pre-punched zone arranged in accordance with the code in use. The two punches corresponding to the data required are joined by a notch. For selection, needles are inserted into the holes, the set of cards tipped over and those containing the information wanted slide out of line with the rest and can be seen at once. This system permits all the sorting criteria to be dealt

with in a single operation and can cope with cards containing a larger number of data. Optical coincidence cards (Peek-a-Boo, Selecto, Sphincto, Thermatrex, etc.) use a card for each characteristic and not one for each document as in the preceding system. The records of the documents are numbered and kept in a master file. The punched cards contain one or several grids to show the number of the document concerned by means of the configuration of holes. When a document has one or more characteristics covered by the system, the corresponding card or cards are punched so as to indicate the number attributed to the document's bibliographic record. Selection is made by placing all the cards with the desired feature on an illuminated reading table and the light, streaming through the punches which coincide for all the cards, shows up the numbers of those documents which possess all these features.

The system can cope with quite a large number of cards and is quick to operate, but search has to be done in two stages: identification of the relevant numbers and then access to the records and documents. If used a great deal, the cards can become worn and thus the chances of the holes coinciding is reduced.

The microform systems employ a microfilm with one zone for the bibliographic record and another for a code represented by marks. A special reader senses the presence of these marks in the position dictated by the code for the wanted data, stops the reel and displays the record of the document. When the record has been examined by the user, the reel is restarted and continues automatically until the next relevant record. It is a rather fragile and complicated—hence costly—system with a relatively limited search potential. Its main interest is for processing the full text of a document.

Audio-visual documents need various pieces of equipment such as viewing tables, viewers, slide-projectors, projectors and viewers for films of different dimensions, video recorders, tape-recorders and record players. There is a great variety of specialized equipment on the market and choice is complicated by the fact that there has not yet been much progress in standardization (particularly in regard to formats). Such apparatus is often fragile and expensive and therefore has to be stored and handled in special ways. It must be kept in first-class running order or the documents will quickly deteriorate.

Telecommunication equipment includes:

Telephones and internal and external switchboards: in every country telephones are being increasingly used for information transfer and if there are not enough of them the unit will quickly find itself handicapped.

Telephone-answering machines, which are in fact automatic tape-recorders linked to a telephone. They give and record messages automatically while the person concerned is away and can be very useful (even for the dissemination of information).

Facsimile machines, which transmit and receive images, such as pages from documents, via the telephone network. Though still rather expensive they will soon be used on a rapidly increasing scale.

Teleprinters, connected to the public telephone network, allow the many organiza-

tions using them to communicate directly, quickly and reliably with each other. They include a printing-and-punching mechanism for transferring messages beforehand on to punched tape so that they can be transmitted *en bloc*. Then machines are easy and quick to operate. Experiments in searching bibliographic records by telex have proved successful, in particular between Argentina and the United States.

The concurrent development of data-transmission systems, remote access to computers, cable television and artificial telecommunication satellites is making the possession of telecommunication equipment and know-how increasingly important for information units.

Transport facilities, in view of the poor communications in many countries, should take the probable types of service needed into consideration. Possibilities include bicycles, motorcycles, light delivery vehicles, vans (for a mobile microfilming unit, for example), minibuses and larger vehicles for mobile library services, travelling exhibitions and so on.

Preferably, the information unit should be allocated for its own permanent use at least some vehicles which could be used for the services users tend to expect. A fleet of vehicles being rather expensive to maintain, it should be kept small and for use of the unit alone.

Printing and duplicating equipment. All information units need a certain amount of this equipment, and they should be able to use the services of their parent organization's specialized workshop or those of local firms that do this kind of work to order. In practice, however, every unit beyond a certain size will have to cope with routine printing requirements needing at least a small duplicator, especially if it cannot get outside contractors to respect its strict deadlines: any regular bulletin that comes out very late loses much of its interest—and many of its readers.

The duplicating process uses an intermediary document—the printing plate—on which the original document is reproduced. The copy is obtained by transferring the ink from the printing plate to a sheet of paper. There exist three techniques—spirit duplicating, stencil duplicating and offset printing—which require quite different machines and are used for specific purposes.

Spirit duplicating transfers the image from an inked master copy to paper moistened with a spirit solution. Only a few copies (up to about 100), rather poor in quality and quick to fade, can be obtained, but it is a simple and economical process.

Stencil duplicating utilizes a master copy made of an ink-impervious substance. The letters or drawing are cut into the master and the ink is squeezed through and deposited on the paper. Stencil duplicators can be manually or electrically operated and the method is simple, inexpensive, quick and produces quite good results. There exists a type using small specially prepared stencils for reproducing ordinary catalogue cards.

Offset printing uses a plate on which the ink is deposited on the image areas, the non-image areas having been coated with a watery solution. This process produces a

large number of copies of a quality comparable to commercial printing. There are a wide range of machines on the market, from very simple models to fully automatic ones, but they are always rather awkward to handle and require skilled personnel and proper installation.

Some machines make stencils and offset plates automatically from the original document while others can transfer a photograph to an offset plate.

Large information units are increasingly turning to computer-linked photo-composition equipment (using film) to prepare long bibliographic bulletins.

There also exist machines for automatically composing the titles and text of documents, i.e. spacing the text out correctly to the right-hand margin of the page (this is called 'justifying the lines').

Most information units also have small machines such as paper-cutters, collating devices to put the pages in order, jogging machines to line them up and various types of binder to put the finishing touches to the document.

Reprographic equipment, used for reproducing documents, is an indispensable item in constant use in every information unit. There now exist a wide range of machines using different processes and producing copies on different carriers, the same size as the original or on a reduced scale, one at a time or in quantity, from ordinary documents, half-tone documents or microforms.

Some of these machines require special paper while others do not, and in some cases various chemical are needed. Before choosing a particular process and machine, therefore, the unit's needs should be carefully assessed (amount of use, number of copies, types of original document, types of copy required, etc.), and possible machines compared as to cost (purchase price, cost of supplies, servicing, personnel, maintenance) and requirements.

There are two kinds of copying process in use:

The contact process, in which the copy's carrier is placed directly against the original. The most common form of this method is electrocopy, in which a black powder is fixed by exposure to light; diazo-copy, in which certain salts are destroyed by infra-red radiation, is mainly used for large documents such as technical drawings, maps etc.; thermography works through the application of heat.

The optical process, such as normal photography—to obtain copies on transparent film—or electrophotography (xerography).

Microcopying equipment is used to produce or view microforms which are becoming increasingly important for information units as they save so much space and weight. There exist two types of microform: those in which the images are presented on a continuous carrier (a strip or roll of film) are called microfilms and are readily obtainable in 16 or 35 mm, and those, called microfiches, which reproduce the images on a sheet of film.

Microfiches can hold a varying number of images, and their upper border has an inscription which can be read with the naked eye showing the bibliographic reference of the document and other data (identification number for instance). They can be produced directly or built up from strips of 16-mm microfilm inserted

into sleeves (jackets). Owing to the number already in use, their growing popularity and general usefulness, every information unit should be equipped with at least one microfiche reader.

A distinction is drawn between readers and reader-printers that can immediately supply a normal size copy of a document on paper. There exist many devices of this type of varying sizes (some are portable), different degrees of sophistication (some have a system for the automatic selection of images, can be fitted with different lenses or be adjusted the brightness, etc.) and capable of reading a single type of microform or both types, etc.

The price range is also considerable, but small microfiche readers of fully acceptable quality can now be found for well under \$100.

To read microforms, the user has to make a special effort, partly because they are unfamiliar to him. The equipment must therefore be chosen with great care, taking into consideration: (a) the quality of the image; (b) the quality of the screen (sharpness, brightness, etc.); (c) viewing capacity (a full view); and (d) ease of handling (adjustment, power, positioning of microforms). The microforms can be stored in special fixed or movable cabinets.

The equipment for producing microforms includes various kinds of camera: flat-bed or flow microfilm and/or microfiche cameras photographing page by page (i.e. original and film are stationary during exposure) or continuously (i.e. original and film move in synchronization); cameras for microfilming maps, technical drawing, and large documents; and portable cameras, which can deal satisfactorily with most routine situations. There has not yet been much progress in colour microforms.

The production system also requires devices for automatically developing the film, producing duplicates (the initial microform or master microcopy should always be kept in the archives and copies only should be used) and quality-control instruments (densimeters). In addition, there exist jacket fitters with which microfiches can be made from microfilms.

A microform production chain can be connected to computer output devices such as the Computer Output Microform (COM), but this equipment, being costly to install and requiring skilled operators, is only justified in the case of a large information unit.

Check questionnaire

What is involved in the material installation of an information unit?

What is an 'installation programme'?

List the various items of equipment that may be found in an information unit.

What are the different types of punched card?

What would a full set of equipment for telecommunication contain?

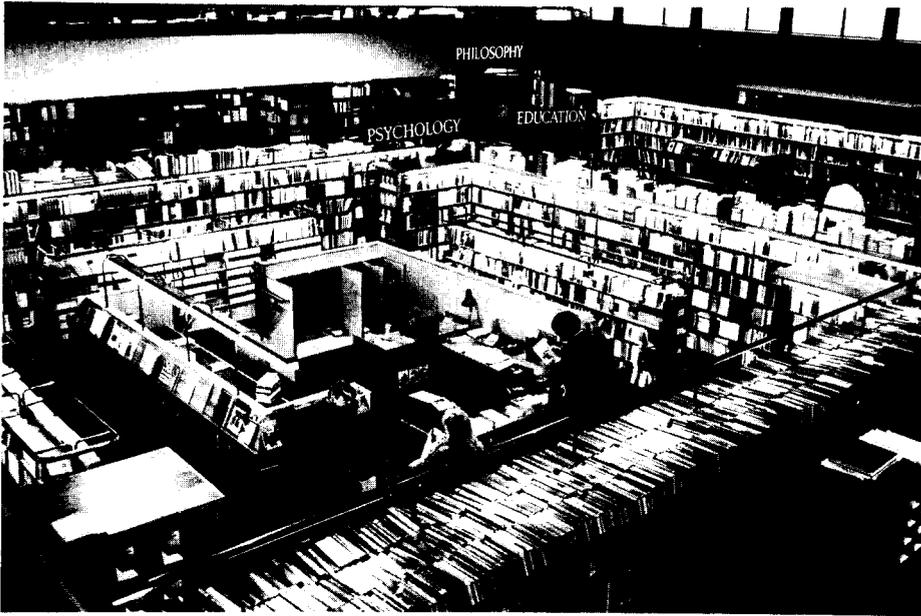
What is microcopying?

What are the three possible forms of paper duplication?

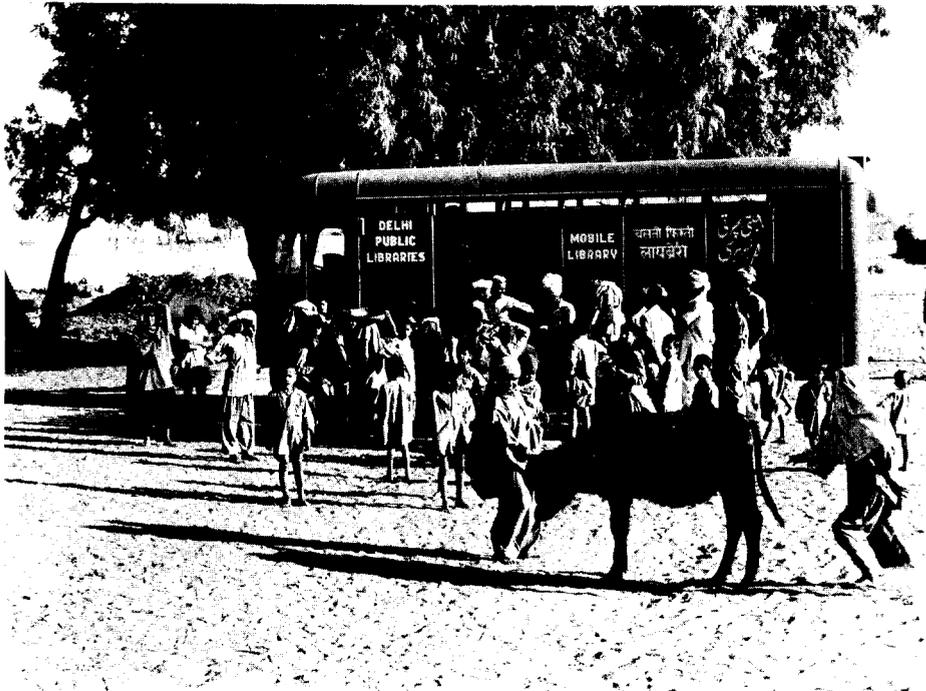
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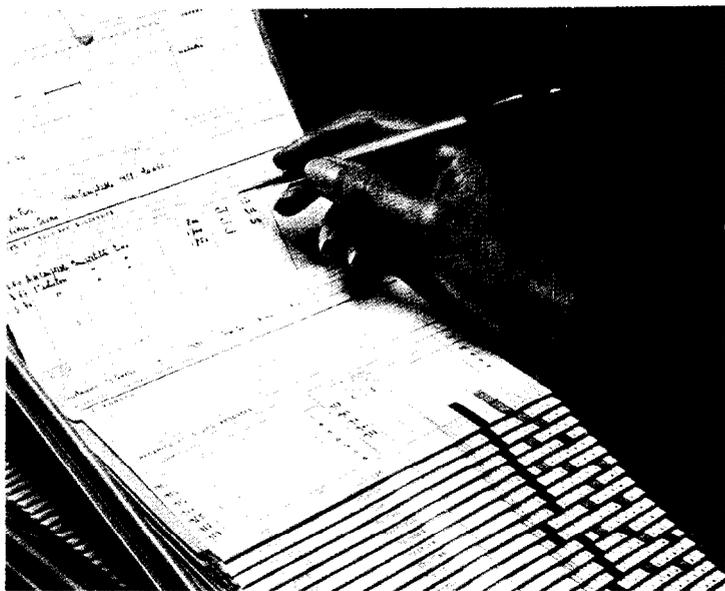
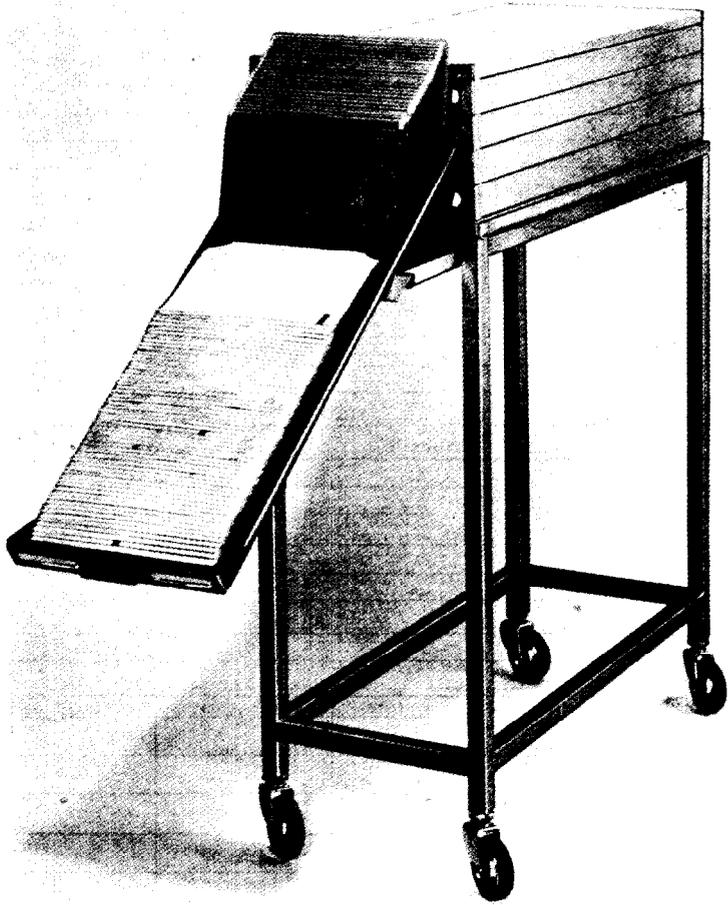
Appendix. Illustrations



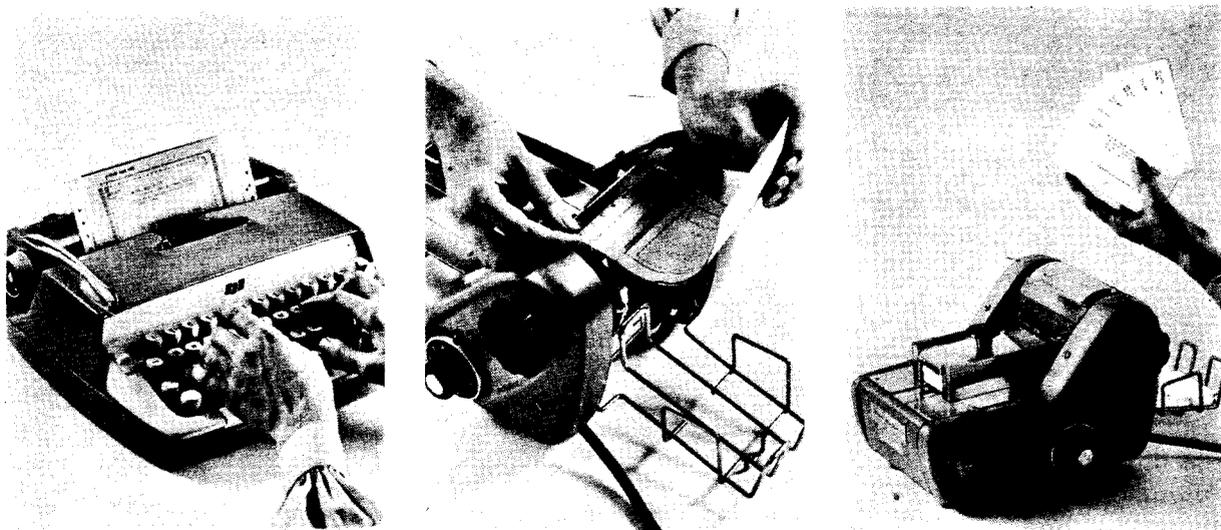
Oxford, United Kingdom. Blackwell's Bookshop.



Bibliobus. Public Library of New Delhi.



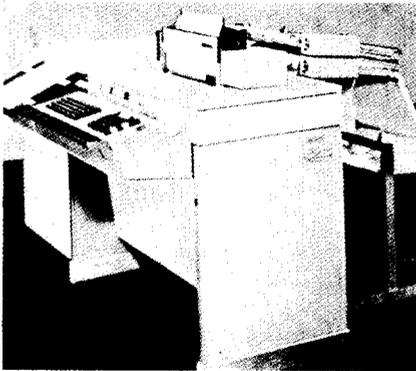
Kardex for periodicals.



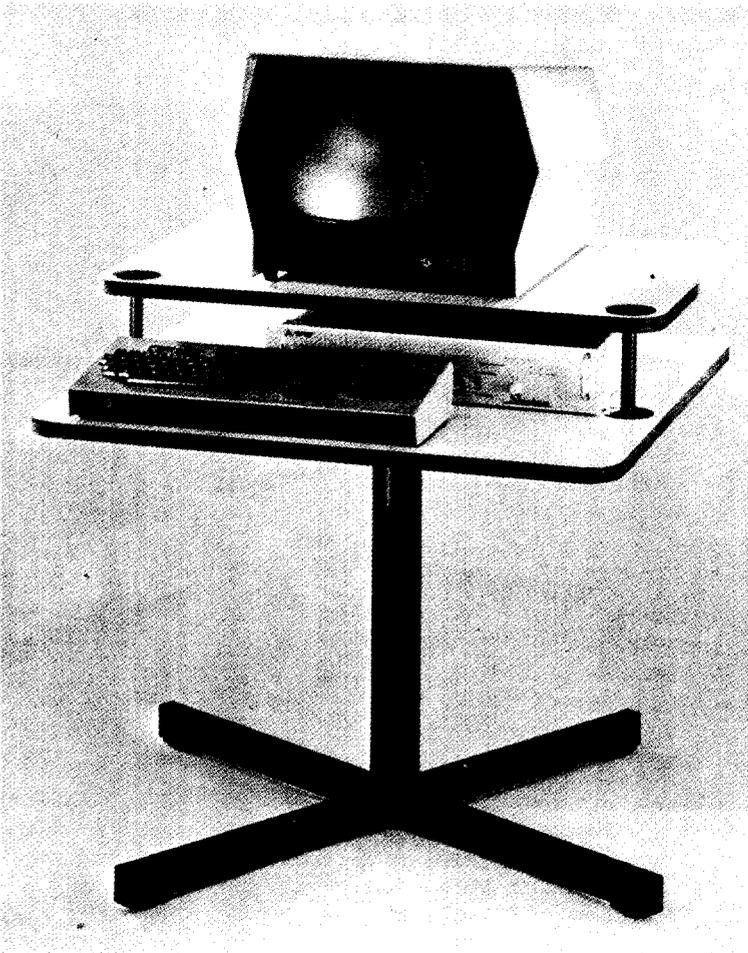
A model of card duplicator.



- A computer.
- A. 1. Printer.
 2. Magnetic-disc unit
 3. Card reader.
 4. Console.
 5. Central unit.



An office mini-computer.



A terminal.

13 Computers in information units

The role of computers in information units has continued to develop at an ever increasing pace. Today, every information service relies directly or indirectly on the use of computers, and in the near future, integrated networks for computerized information are likely to become very common.

Information systems often handle very large quantities of data for relatively simple and repetitive processing and, like other enterprises, must also deal with administrative tasks. For this type of work the computer is the most appropriate tool.

The first computer applications were focused on information retrieval and the production of bibliographic bulletins and indexes, but their range has gradually extended to all technical and administrative operations and user services.

It is now common to find fully or partially computerized systems for acquisition, cataloguing, indexing, file construction, information retrieval, documentary products (bulletins, indexes, SDI, etc.), loan operations, data retrieval and exploitation, and routine control and administrative operations.

Computer systems, however, have to be designed, maintained, fed with information and used by people. In other words, they do not simply replace human beings but instead call for a high level of qualification and at least as much, though admittedly different, work for advantage to be taken of their enormous processing capacity.

Another important point is that computer technology is making such rapid progress that pricewise and in conditions of use it is now within the range of most organizations—and of individuals too—throughout the world. Having long ceased to be a luxury for powerful organizations, the computer is becoming a familiar object, and an understanding of how it works is nearly as important as knowing one's own language.

Definition

A computer system comprises: (a) specialized personnel; (b) electronic data-processing devices (hardware), i.e. the computer and its peripheral equipment; (c) telecommunication devices if needed; and (d) software, i.e. the programs or sets of

instructions by which the machines are made to execute specific predetermined tasks.

Each of these factors can be aligned with the particular needs of each application, the level of qualification or the performance required all vary considerably. It is now possible to purchase or develop a wide range of products and services relating to these four factors.

Moreover, organizations can also utilize some of the possibilities available in other organizations, such as their hardware, certain of their staff and some of their software, in order to computerize certain activities without having to bear the cost of a full computer system. It has become common practice to turn to a company offering computer services or to the computer centre of another organization (service bureau), or to join a time-sharing computer network.

Like any piece of equipment, a computer—particularly a large one—should be used at full capacity. The big computer centres generally work on a continuous basis, in shifts.

Specialized personnel

The specialized personnel needed to run a computer system include:

System engineers, to supervise the setting up and maintenance of the system (i.e. the hardware).

Analysts, to examine applications, i.e. the jobs to be computerized, and to adapt them to the computer.

Programmers, to prepare—using the framework provided by the analysts—the sets of instructions which will enable the computer to perform the work demanded and which must be expressed in a language the computer can understand.

Operators, to feed the work into the computer and watch over execution. A particular member of this group is the keyboard operator, who directs the computer from the control terminal.

Keypunch operators, to deal with data entry and the transcription of data on machine-readable carriers.

Depending on the size of the computer centre, certain functions may be performed by the same person (an analyst-programmer for example) or split up among several people. For the very large computer departments of organizations, managerial problems among others have led to a complex hierarchical structure. The skilled technicians needed for maintenance of the hardware and the basic software are usually provided by the firm installing the equipment.

It is becoming increasingly common for computer specialists to be trained in universities, where they can specialize in certain applications such as scientific calculations, management, or computer systems. Special short courses are organized to train staff in the most straightforward tasks or to give further training on new systems, languages, equipment, etc.

Hardware

Computer hardware includes two basic types of device: (a) the central processing unit, which processes the information; (b) peripheral equipment, which handles the input, output and storage of informations.

Figure 7 sums up their interrelations:

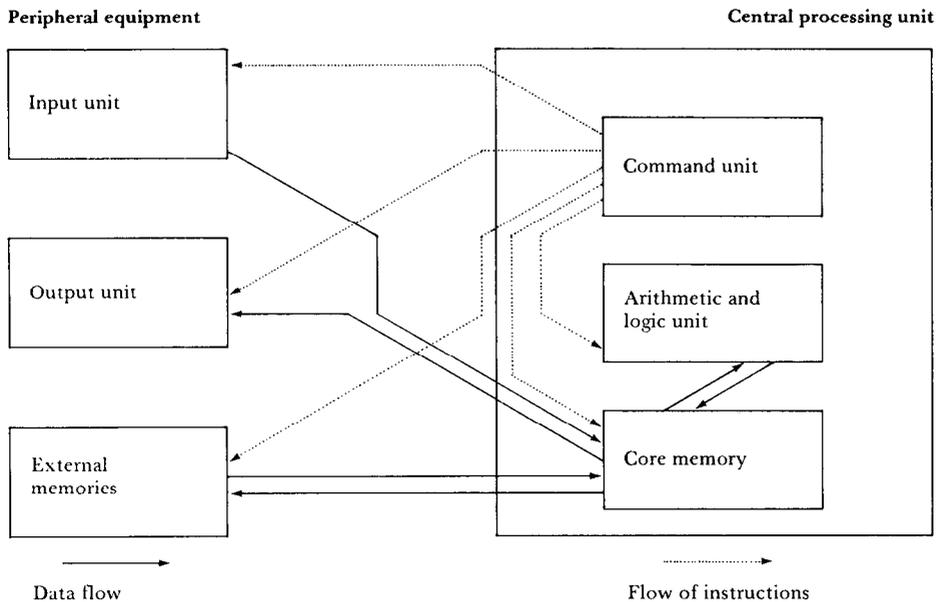


FIG. 7. The interrelation between the central processing unit and peripheral equipment.

These machines contain electromechanical and electronic devices which are capable of reading and writing, memorizing, mathematical computation, and logical operations (sorting, comparing, etc.).

In addition, there are data-entry devices, used to transcribe information on machine-readable carriers, which can function separately or be connected to the computer. Various other devices are used for handling or storing computer products, such as a listing decollator, cabinets for punched cards and fire-proof climate-resistant cupboards for storing magnetic discs and tapes. Special precautions have to be taken to ensure the security and good running order of the machines: air-conditioning, protection from dust, fire and flooding, voltage regulators, access for authorized persons only, etc.

The information fed into the machine is expressed in the binary code, i.e. in a code containing only two signs (0 and 1) according to whether the magnetic

carrier of which the computer is composed has or has not been sensitized (has or has not received an item of information). Each character of a system using natural signs is therefore converted into a series of binary numbers. There exist many different coding systems for the various computers, the two most important of which are EBCDIC (Extended Binary Coded Decimal Interchange Code) and ASCII (American Standard Code for Information Interchange). In the latter system, for example, '1' is written '00 11 00 01', 'A' '01 000001' and 'a' '0110 0001'. If computers use their own distinct codes, difficulties can arise when it is desired to employ data produced elsewhere or to work in co-operation.

Each elementary piece of information (0 or 1) is called a 'bit' and 8 bits make a 'byte'. A byte often corresponds to a character, but the number of bits required for each character in the machine also depends on the model of computer.

The central processing unit (CPU) is the heart of the computer. It is the CPU that does all the actual processing and controls the whole operation. It is composed of:

The core memory, in which the machine's internal programs and application programs are recorded together with the data to be processed which, called upon as required, yield intermediate and final output. The core memory consists of integrated circuits through which an electromagnetic current passes. The data stored here can be transferred directly to the processors (in this case the memory is termed 'addressable').

The command unit, whose function is to see that the instructions represented by the programs are executed in sequence by the various parts of the computer and to monitor the operation.

The arithmetic and logic unit, which carries out the processing itself by sorting, computation or comparison.

The peripheral equipment is distinct and physically separated from the central unit—sometimes even a long way away—but is connected up to it and obeys its instructions. Each central unit can be linked to a fixed but often very broad range of peripheral equipment chosen to meet particular needs and including two main types of device: input-output units and external memories.

Input-output units make it possible to write, read, or both, and are the means whereby the user communicates with the machine.

External memories are used to store data before and after processing and, for this purpose, receive the files, which vary in size.

Special carriers are utilized by these machines to hold the information in a machine-readable form:

Punched cards, the most usual format being a rectangle of thin cardboard 187×82.5 mm with 12 lines and 80 columns, each of which can contain a character.

Punched tapes, which are paper tapes 25.4 mm wide taking columns of six, or more often seven, punches and a line of check punches. Each column can receive one character.

Magnetic tapes, which are made of plastic with a magnetizable coating. They are 12.7 mm (half-an-inch) wide and contain nine or sometimes seven, tracks. Each

character is recorded on eight (or six) tracks in a single column and the ninth (or seventh) track is used for a check code (parity number). Tape capacity is defined by the number of bits (and hence characters) per inch (BPI) in each column, each record being separated from the next by a gap of a fixed length. The most common density is 1,600 BPI and a tape of normal length (2,400 feet or 730 metres) can hold up to 46 million characters at this density.

Magnetic discs, which are flat circular plates with a magnetizable coating on both sides. They usually come in 'disc-packs', i.e. a pile of discs joined to form a single unit. Specifications (running speed, transfer speed, capacity, number of tracks) vary widely with the model.

Mini-discs, which are small single discs.

Original documents can sometimes be employed directly, either because they use special characters suitable for optical character recognition (OCR) or because their structure permits the use of an analyser (images, objects).

External memories are units capable of reading and writing on magnetic tapes or discs. As a rule, both these types of device are used in conjunction since the number of them in each system will depend on its needs. Manufacturers offer a fairly wide range with greatly differing capacities and performances.

Memories on discs are addressable, i.e. one can locate exactly the position of the information. Memories on tapes are sequential, i.e. they have to be read continuously until the wanted item is found. They are controlled by the central unit (Fig. 8).

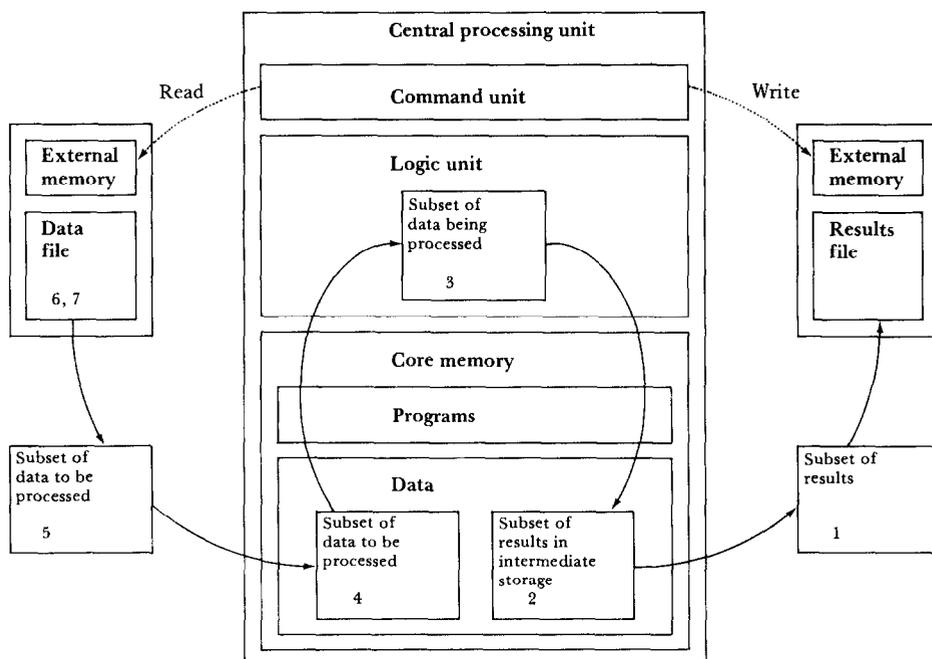


FIG. 8. Central Processing Unit.

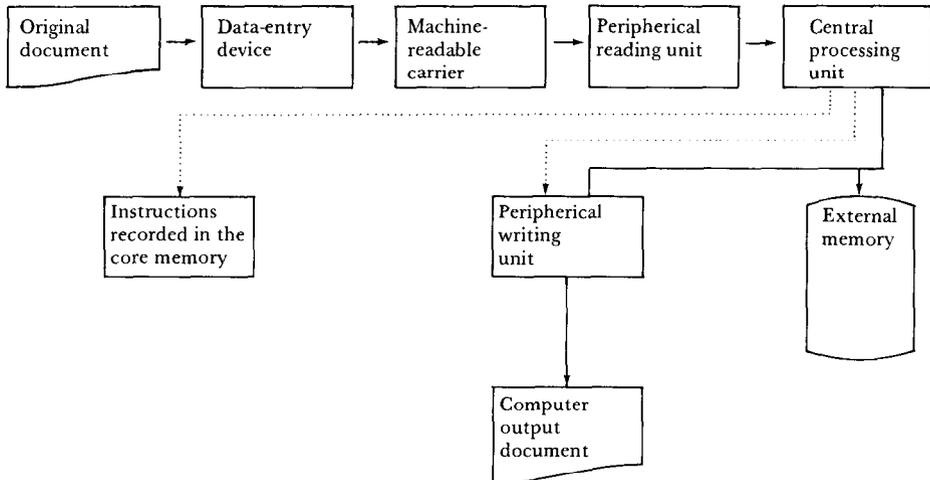


FIG. 9. The interrelation between input-output units and the computer.

Input-Output units serve to feed the computer with data and instructions and to receive back the data it has processed, as shown in Figure 9.

Reading, apart from the input-output functions performed by the external memories, can also be done by: (a) (punched) card readers; (b) (punched) tape readers; (c) tape drive units; (d) disc units; (e) mini-disc units; (f) optical readers, for scanning documents printed with special characters which they analyse and convert into magnetic signals (optical character recognition (OCR) readers); (g) image or object analysers; and, finally (h) light pens, which are used to write on cathode-ray-tube (CRT) screens.

Writing can be performed by:

Printers, either similar to typewriters or machines using a string of characters (line printers). They produce documents on special paper (listing).

Cathode-ray-tube (CRT) screens, rather like television screens: the data are displayed, usually on twenty-four lines, and then replaced by other data on the instructions of the user. They do not produce permanent documents.

Graphic printers, for graphs and drawings, which produce documents on paper.

COM devices (computer output microform), in which the data shown on the CRT screen are automatically microfilmed to produce microforms.

Terminals are input-output devices composed of a typewriter keyboard equipped with additional special-function keys and generally a printer and/or CRT screen. They can be used to give instructions to the computer, for direct data entry, input and output.

There is an even greater variety of peripheral equipment than central units, with capacities and performances for every kind of need.

Data entry devices include: (a) terminals; (b) tape-punchers which, coupled to an ordinary typewriter, can simultaneously produce normally typed documents;

(c) card punchers and verifiers; (d) mini-disc units; and (e) electric typewriters with OCR 'golf-balls'.

The range of computer equipment, already considerable, is steadily widening. So far there have been three generations of computer, each marked by an increase in processing capacity as a result of technological advances, particularly in regard to electronic components. In the last few years mini-computers have made their appearance, distinguished by miniaturization without loss of memory capacity, which can compare with that of third-generation computers. A more recent development is the micro-computer, very small in size and of limited capacity, but suitable for numerous applications, in particular for individual users.

The main distinguishing features of computer equipment are:

Capacity (for memories and carriers), expressed in the number of words, characters or bytes, or in thousands of these units (K byte, sometimes simply K) which can range from a few bytes to several thousand K.

Access time, or the time taken to obey an instruction or gain access to a data element in the memory. It is counted in thousandths of a second (milliseconds) or millionths of a second (nanoseconds) and ranges from a few nanoseconds to a few hundred milliseconds.

Speed of reading, writing and transmitting, expressed in characters per seconds or lines per minute. For example, normal speeds are roughly:

- 200–800 characters/second for a card reader,
- 20,000–200,000 characters/second for a tape drive,
- 2,500–800,000 characters/second for a disc unit,
- 100–1,500 lines/minute for a line printer,
- 10,000 characters/second for a CRT terminal,
- 5–18 characters/second for a telex line,
- 200–480 characters/second for a telephone line.

The greater its capacity, the higher its speed and the shorter its access time, the more powerful the computer is; but it is important for these three factors to be in harmony with each other to avoid congestion or waiting as the case may be.

The configuration of a computer system is represented by the type of equipment selected and its distinguishing features. Some applications necessitate a minimal configuration, i.e. computers with a certain minimum capacity (and possibly speed). The processing of bibliographic files, for example, generally requires a core memory capacity of 64 K, input-output units and several disc and tape units.

The cost of computer equipment of comparable capability is showing a marked downward trend. It can be purchased or hired from the manufacturer. The cost price of the systems at present in use varies from a few thousand dollars to several hundred million to which must be added the cost of the necessary regular servicing.

Telecommunication devices are playing an increasingly important part in the operation of computer systems owing to the development of computer networks, as 'teleprocessing'. They permit remote access to a computer by means of terminals connected to the central unit through a telecommunication network.

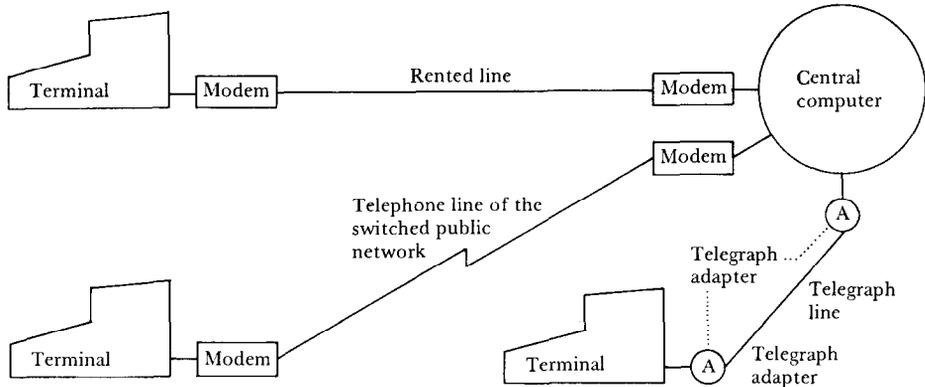


FIG. 10. The structure of a simple network.

It does not matter how far the terminals are from the central unit, and there can be any number of terminals or interconnected central units with different functions. Figure 10 shows the structure of a simple network:

The telecommunication equipment that backs up the computer system includes: Devices able to convert the binary signals produced by the computer and terminals into signals that can be sent along a telecommunication line, and vice versa. Telegraph adapters can be used when necessary but the most widespread device is the 'modem' (modulator-demodulator), which can be connected to the telephone network either directly or via an acoustic adapter into which the telephone receiver is simply plugged.

Telecommunication lines, which can be those of the public network (switched networks), of specialized networks for data transmission, or lines especially rented for this purpose by the user. Line capacity is usually measured in bands and corresponds to the modulation speed; it is the reciprocal of the duration of an elementary signal.

For transmission one can use: (a) telegraph lines of from 50 to 200 bands; (b) telephone lines, with a transmitting speed of from 200 to 2,400 bands, and up to 72,000 bands for specialized networks; (c) wide band lines (coaxial cables and hertzian waves), from 48 K to over a million bands. The organization of a complex network is represented in diagrammatic form in Figure 11.

An extended network calls for additional devices, such as concentrators, small computers for monitoring the lines, and front-end computers acting, so to speak, as the 'secretaries' of the central units. The development of teleprocessing has also led to 'intelligent' terminals which amount to genuine small computers capable of handling certain operations.

Complex networks have two levels: first, a communication level, composed of concentrators and the lines between them, whose function is to dispatch messages

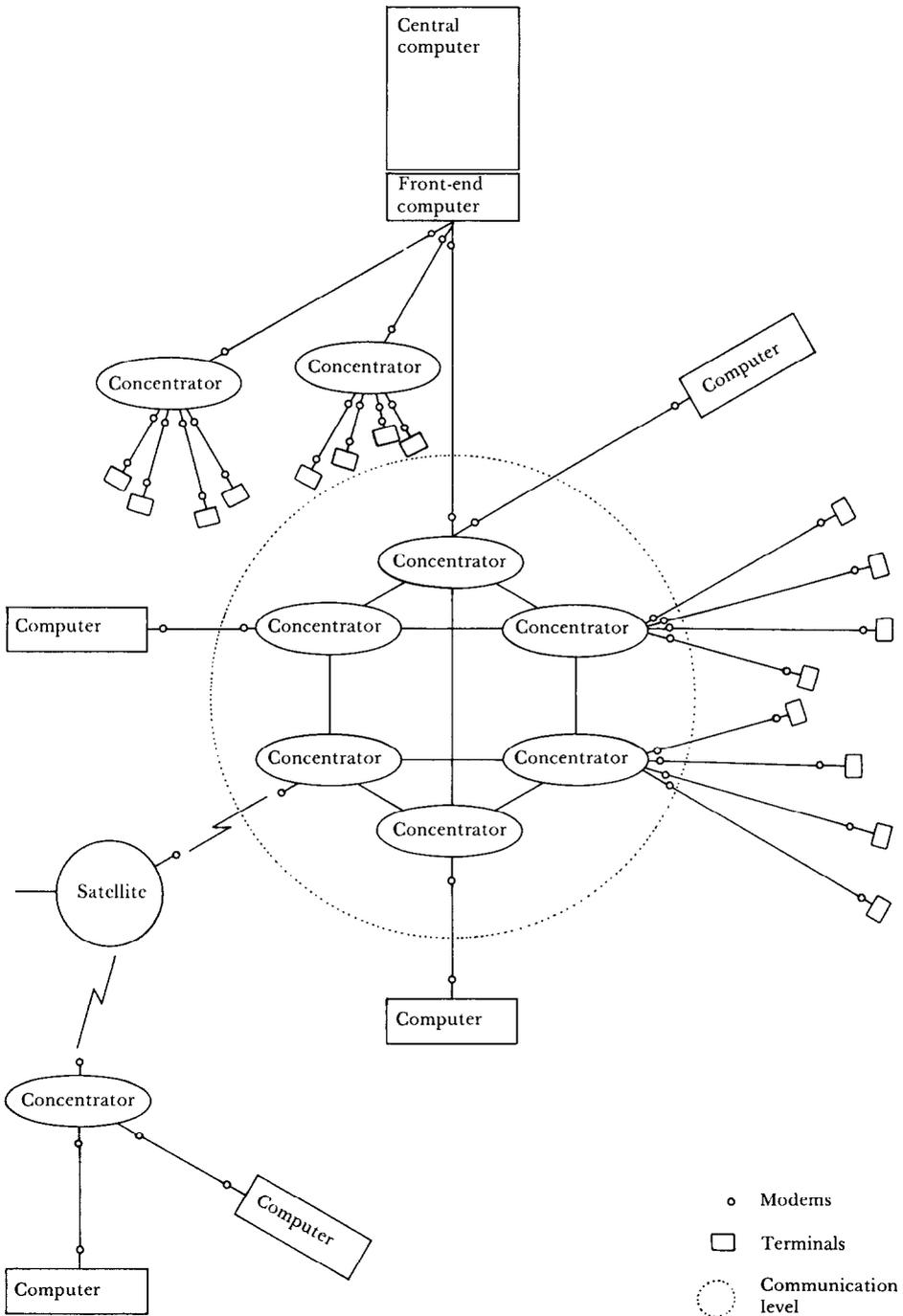


FIG. 11. Diagram of a nested network.

through the telecommunication network; second, a processing and operations level composed of terminals and computers, of which those giving access to data bases are called 'hosts'. Messages are sent in batches, that is, in sets of messages of a fixed maximum length set out as follows:

Start	Address	Routing data	Administrative data	Data	Control numbers
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Any user (terminal) of this type of network can communicate with all the nodes of the network (see the appendix to Chapter 18 for a brief description of two networks, EURONET and TYMNET).

Teleprocessing is heading for a brilliant future since it can considerably reduce the impediments to communication without raising serious moral problems.

Software

The software consists of structured sets of instructions which enable the computer to perform the required operations. These instructions are expressed in 'machine language', i.e. a language based on binary coding that can be directly understood by the computer, or in an advanced 'programming language' which is translated by the computer into machine language. Man-machine communication therefore passes through the following stages shown in Figure 12.

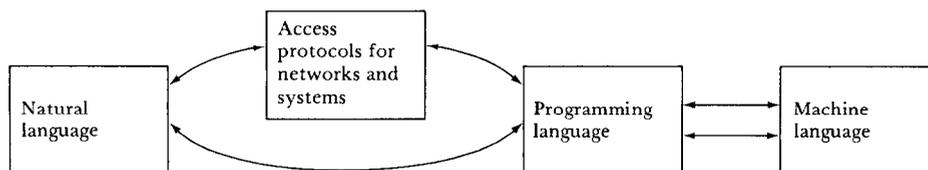


FIG. 12. The stages from natural to machine language.

There are two types of software: the manufacturer's software, which is built into the central unit to control the functioning of the computer for all processing operations, and application software which is especially prepared for a given task and user.

The manufacturer's software is mainly composed of: (a) the exploitation system, which depends on the type of computer and controls the various internal processes; (b) compilers, which convert advanced languages into machine language

by means of syntactic analysers and assemblers; and (c), in some cases, data base management systems (DBMS), this term being used in its broadest sense.

Application software is extremely varied. In some cases it is provided by the manufacturer or can be obtained from companies specialized in computer services, and in others it is developed by the user for his own needs. In principle, software is designed for a specific application, such as information retrieval or stock management.

There exist software 'packages' for handling a series of specific applications corresponding to the set of interrelated tasks involved in a complex operation (for example, Integrated Set of Information systems—ISIS): acquisition, file construction, the printing of bibliographic bulletins, information retrieval and so forth.

The software is composed of an integrated set of programs that control each of the separate tasks involved. The layout of data for input or output and the file structure are rigorously determined by formats. Some types of software, called 'interfaces', can transfer data from one type of format to another (e.g. bibliographic descriptors from the AGRIS format to the ISIS format).

The analysis of computerized operations is the basic technique for the preparation of software and proceeds in two stages, functional analysis and organic analysis.

Functional analysis is the detailed study of the problem in hand and possible solutions: each task has to be broken down into the sequence of basic actions involved, since the computer can do nothing without being told. For operations on a larger scale, analysis focuses not only on the actual computer processes but on all preceding and subsequent operations that might influence it (e.g. a data-entry format must be defined in terms of information available at this point and information that will be needed for subsequent exploitation, and also bear in mind the working conditions of the personnel involved). Functional analysis then decides on the various files to be constructed and describes the processing operations required. This is followed by organic analysis, whose function is to decide what parts of the computer will be needed for each phase of the task, the arrangement of the files, the formats and the list of operations. Leaving nothing to chance, the analyst thus works out the route to the desired result.

The most common analytical tools are flowcharts, which use standardized symbols to provide a graphic representation of the operations concerned and their sequencing, and decision tables, which give a detailed explanation of the flowchart in the form of a matrix.

Programming consists in converting the various operations defined by the analyst into a series of structured sets of instructions or programs. All programs describe the data to be processed, give their address (location within the computer), provide sets of instructions for sequencing the basic tasks (e.g. read such and such an item in such and such a place in the first record and, if it is equal to X, write it on such and such a file in such and such a way; read the second record . . . and so forth) and describe the data needed. A program can also be prepared and

described by means of a flowchart. The fewer the manipulations and the shorter the execution time, the better the program. Once finished, the program is tested, if necessary corrected and then stored on magnetic carriers which can be installed on the computer when needed.

Programming languages

Programming languages are artificial languages which serve to convey instructions to the computer. They have a predetermined structure and a limited number of writing rules, and the main ones are: FORTRAN and ALGOL, for scientific calculations; BASIC and APL, for time-sharing applications; COBOL, for business applications; PL/I, for general applications.

Utilization of the computer

Utilization of the computer depends on its configuration. First-generation computers could only handle one program at a time, but modern devices take advantage of the fact that reading and writing operations are slower than logical operations in order to execute several programs at once. This is known as multiprogramming.

The existence of terminals allows several users to have simultaneous access to the same computer and to have it execute their several programs at the same time. This is called time-sharing and is naturally based on multiprogramming techniques.

When a user is linked to the computer through his terminal, he can ask for his operations to be performed at once (on-line or real-time processing). But he could also ask for some of them to be carried out later on request, without his having to be in contact with the machine (off-line processing).

Batch processing consists in merging a number of identical operations from different sources for execution in one batch by the computer, thus saving processing time.

When a computer system is used on-line or in real time, the data flow to and from the central computer and the terminals. For example, the loans disc of a library could, via a terminal, see that the identification number of a book just borrowed by a user is entered into the loans file, or it could check automatically whether or not the book is already out. More and more computer systems, however, are gradually coming to 'dialogue' with the user: in a cataloguing system, for example, it would no longer be the librarian's job to enter, one after the other, all the information contained in the various data fields of an input sheet since the computer itself would call the data fields in turn and give warning of any errors or omissions. The 'conversational' or 'interactive' mode, used chiefly for information retrieval, and its dialogue capability is particularly extensive in networks which permit user access to the resources of all its members.

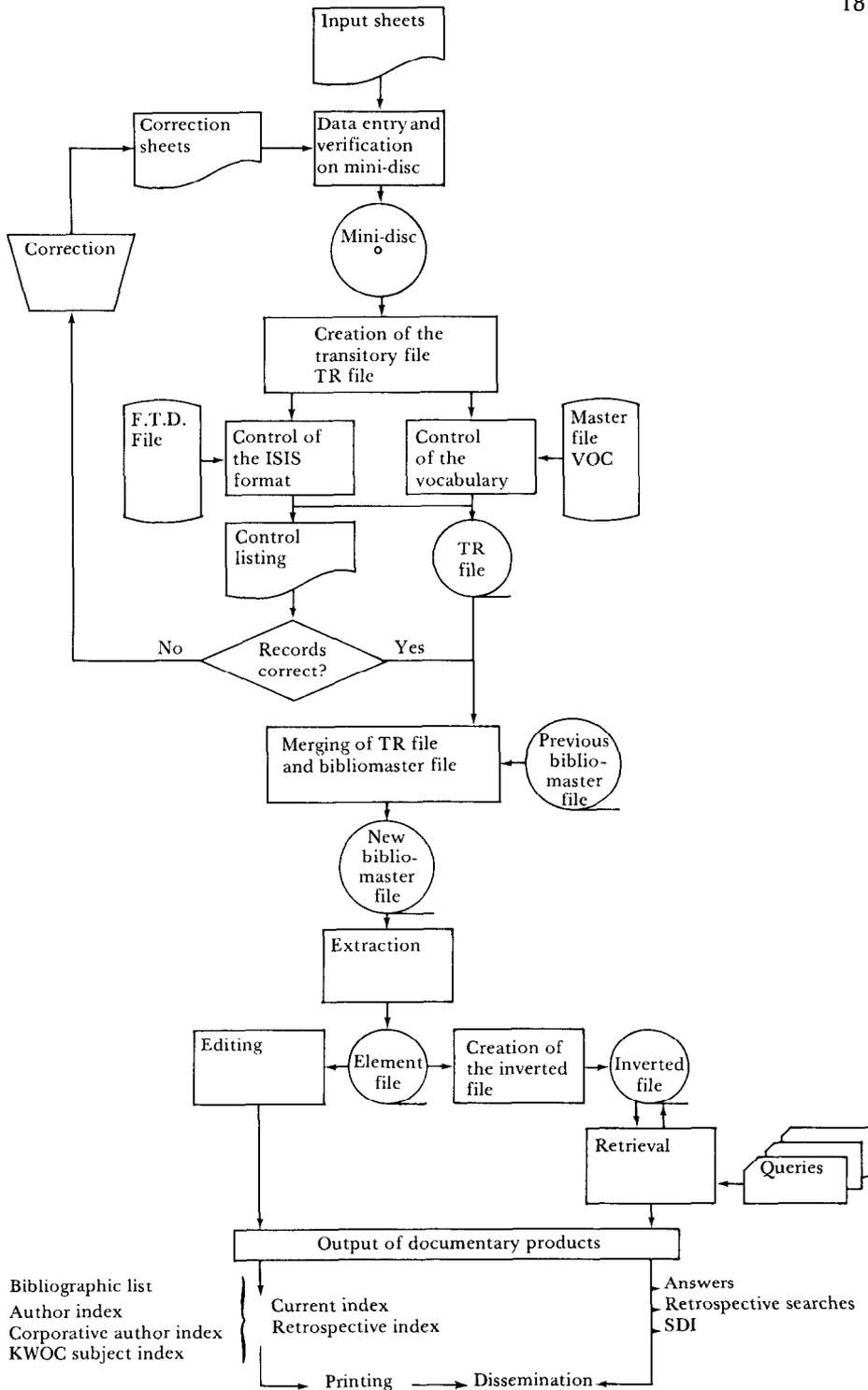


FIG. 13. Simplified diagram of a processing chain for the creation and use of a data base in one application of the ISIS system.

The ISIS system was developed by the International Labour Office and is maintained by Unesco. It is widely used in the documentation centres of United Nations Agencies and in many national documentation centres. There are two versions, one for large computers and the other for mini-computers and it includes a collection of software that can cope with most of an information unit's needs.

For information storage and retrieval, ISIS utilizes six programs for file creation, seven for storage and correction, one for extraction, three for printing, two for deletion (omission of data not required for printing) and a retrieval program.

The operations are based on seven files, the most important of which are the master file (in two versions: the bibliographic file and the vocabulary file containing the thesaurus), the element file, on which output operations are based, and the inverted file. Figure 13 provides a simplified diagram showing how the system functions.

In a computer system, DATA ENTRY depends on the structure of the records, which has to be worked out beforehand according to the type of data and processing needs. In both input carriers and memories, a distinction is drawn between logical and physical records or files: the former reflect the intellectual ordering of the data while the latter show their location. In practice, a logical record or file can be located on one or more physical records where, depending on the system's requirements, it may or may not be presented in the same order.

A record is a set of data relating to a single item (e.g. the elements of a book's bibliographic description) and is broken down into hierarchically subordinated subsets, as shown in Figure 14.

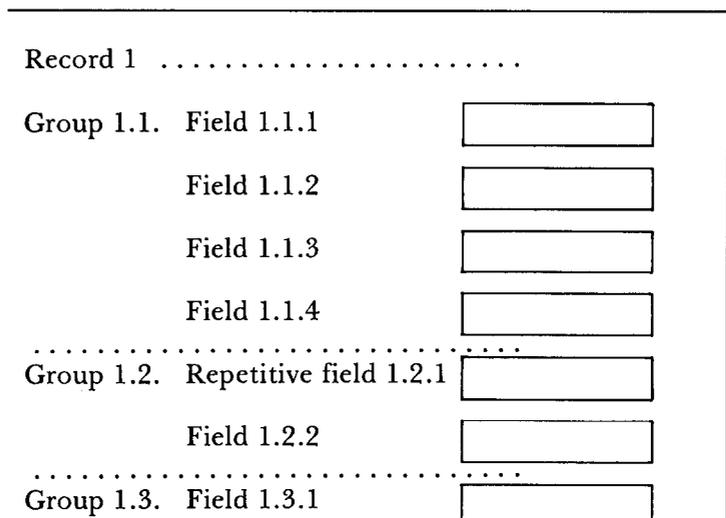


FIG. 14. Hierarchically subordinated subsets.

The field corresponds to a unit of data. In cases where this unit contains several values (e.g. the several authors of an article in a journal) one can utilize a repetitive field, i.e. one that is repeated. The groups correspond to closely related data such as the title, sub-title and translated title of an article.

Some fields are mandatory, while others are of fixed length and may not exceed a stated number of characters. This measure facilitates addressing (or locating them in the memory) and is used whenever the maximum length of a data element can be determined.

The type of characters to be used for expressing a unit of data in each field is also defined: it may, for instance, be decided to use figures only. There also exist strict rules regarding characters that apply to all records and to the system used (capital letters only plus a few punctuation marks, for example). Clearly, the writing rules are extremely precise; they are specified field by field in an operation manual.

A file, where computer science is concerned, is composed of a set of similar records (for example, the identical user profiles of an SDI service). Their physical and intellectual organization can take a variety of forms.

Access to the files can be parallel; in other words, the data they contain can be compared simultaneously on a single instruction. It can be addressed; that is to say only one instruction is required but the comparison is performed sequentially. It can be direct or random, on discs for instance, and it can be sequential when the file has to be read from the beginning until the comparison is completed.

When ordered sequentially, the records succeed one another in order of arrival: if, for example, an alphabetical file is arranged sequentially, the whole file has to be rewritten in order to insert a new record between, say, Da and Do. This can be avoided by chaining, i.e. by indicating after the last record in a particular category (A1 for example) the physical address in the memory of the next record: A1, itself located on Disc 1, Track 1, signals that Am is recorded on Disc 2, Track 2. An alternative method is to use an address file connected to the master file.

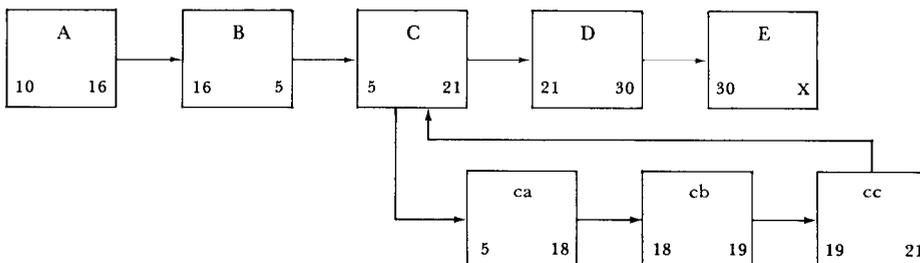


FIG. 15. Diagram of a list. The left-hand figure is the memory location, the right-hand one the pointer and X signifies the end of the list. Note that each element can itself be made up of a secondary list.

Lists constitute another type of organization in which each data element is identified in a table which shows its location in the memory together with the location of the next data element, as in Figure 15.

With an index sequential access file, one has to proceed in stages to find a data element. The first step, for example, is to consult the index of cylinders (set of parallel positions on a disc-pack); this will give the address of the track index for the various discs; then, having identified the track, the record can be found sequentially.

The processing of files involves, apart from reading and writing, two main operations—sorting and merging.

Sorting is the process whereby the records of a file, classified in a certain order, can be arranged in accordance with a particular criterion. For example, one could arrange chronologically, by year of publication, a file of bibliographic records that is already arranged in alphabetical order of authors.

Merging is when two files arranged in accordance with the same criterion are combined to form a single file based on the same criterion (e.g. adding new records from a file of recent acquisitions to a bibliographic file). In practice, a computer system is made up of a number of files. Reading operations can be organized in fixed sequence (the search goes from one file to another in a predetermined order) or in variable sequence (the user decides the order in which files will be processed). When deciding how a file will be organized and arranged, it is important to remember that it will be updated (i.e. records may be modified, corrected, added, deleted or linked to other records): file maintenance is essential to a well-run system. Security is another important point where files are concerned; if it breaks down, it can disrupt the entire system. For this reason all files are copied on regularly merged magnetic tapes as transactions are carried out. Security devices within the computer prevent accidental erasure of the files or detect any faults. Lastly, passwords and codes make it impossible for unauthorized persons to handle the files.

Output operations may be carried out by simply reproducing the files in the system or by employing a special format.

The first method presents little difficulty except when the output is displayed on a CRT terminal with fewer lines than the number of records. The answer to this is to display part of the record at a time.

When the output uses a particular format, the data is first prepared on a special file and an editing program is then needed to give instructions regarding layout (for example, to jump the lines between certain fields, etc.). The editing format should be designed to produce high quality documents—by using the various reprographic processes—from the listings supplied by the printers (for example, the listings can be photographically reduced then transferred to a plate for reproduction by offset).

Large-scale systems rely mainly on photocomposition devices connected to the computer, which allow documents to be printed automatically and on COM equipment for the direct production of microforms.

Check questionnaire

What computer applications could be relevant to an information unit?

What are the main components of a computer?

What is software?

What is a programming language?

What is the function of an analyst? of a programmer?

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14 Information retrieval

Information retrieval covers a range of operations aimed at supplying the user with information in response to specific inquiries or regular needs.

Specific inquiries, generally asking, 'What is known on such and such a subject?', call for retrospective search, i.e. for the identification of all relevant sources in the records. Regular needs are of the type: 'What developments have there been in such and such a subject?', putting the accent on current information, i.e. requiring the identification of relevant sources which have been recorded during the past week, fortnight or month.

'Information retrieval' is a generic term which refers to the retrieval of documents or sources and of the data of facts they contain. Many information units still limit themselves to the first type of activity, leaving it to the user to find the data or facts he needs.

Retrieval operations are situated in the middle of the documentary chain and prepare the way for dissemination. In fact, most of an information unit's activities are designed to facilitate information retrieval since it is on this that the user services depend.

A typical information search could be illustrated by the following example. A user goes to a national documentation centre and asks the reference officer:

'What have you got on building regulations in tropical countries?'

'We should have some documents on this subject', he replies, 'but what are you looking for exactly?'

The user talks the matter over with the information specialist, who learns that the user is working in the Ministry of Construction and has to draw up a table of building regulations for private dwellings in tropical countries from 1976 onwards (except for documents in French). With this more precise restatement of the query, arrived at with the help of the user, the information specialist will work out a search strategy, in other words, decide how to formulate the question in terms of the appropriate sources available.

He will begin by translating the terms of the query into the terms of the documentary language employed in order to obtain search criteria. For example, if

he uses a thesaurus, he would select 'Regulations', 'Building permit' and 'Legislation' as descriptors since the documents dealing with building regulations could have been indexed under any of these terms. This will give the group: 'Regulations OR Legislation OR Building permit'. He would see if the relevant descriptors for each search criterion—Building, Dwellings, Tropical countries—are present. Then each group of descriptors would be linked to the next group by AND since the wanted documents must deal with all these points. Lastly, the information specialist would indicate that documents in French are not requested by using the NOT operator. This particular search obeys Boolean logic, which is one of the most common types of logic used in both manual and computerized search procedures.

Boolean logic derives from the application of Boolean algebra and makes it possible to link descriptors in three different ways:

Intersection, which uses the operator AND: two descriptors must be present in the indexing of the same document for it to be regarded as relevant.

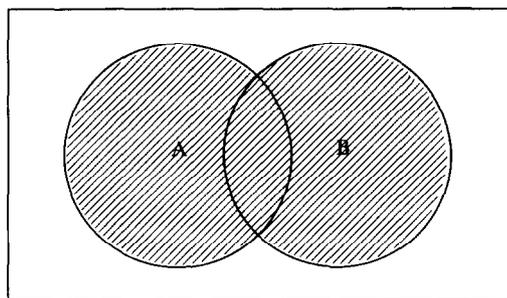
Inclusion, which uses the operator OR: one OR the other OR both of two descriptors must be present in the indexing of the document for it to be regarded as relevant.

Exclusion, which uses the operator NOT: of two descriptors, the first must be present and the second absent for the document to be regarded as relevant.

These relations between descriptors are represented by diagrams, known as Venn diagrams, which illustrate the different types of co-ordination in information retrieval. Each circle stands for a set of elements (documents indexed with the same descriptor) in the field covered by the information unit. This field is symbolized by the rectangle within which the circles are drawn and the parts of the circles which overlap represent the co-ordination of the subjects. In our example, for instance, the co-ordination operations would produce the following search formulae:

1. Inclusion or logical sum:

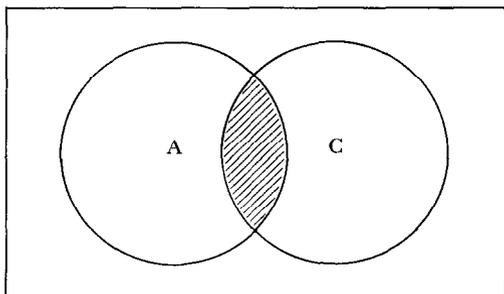
REGULATION OR STANDARD
that is A OR B



All documents indexed by either A or B are relevant (the grey area).

2. Intersection or logical product :

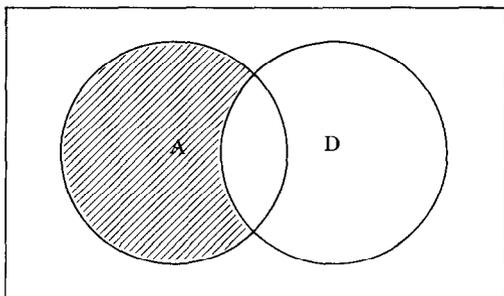
REGULATION AND TROPICAL COUNTRIES
that is A AND C



All the documents indexed by both A and C are relevant (the grey area).

3. Exclusion or logical difference :

REGULATIONS NOT ADMINISTRATIVE
PROCEDURE
that is A NOT D



All documents indexed by A, except for those indexed by D, are relevant (the grey area).

This produces the search formula: (Regulation OR Standard) AND (Tropical countries) NOT (Administrative procedure). This, of course, would be only part of the formula, which would have to be completed by applying a similar procedure to those groups corresponding to the descriptors 'Dwelling' and 'Building', with the exclusions demanded by the user (NOT Office, NOT Methods of construction, etc.), the exclusion of language (NOT French) and of data (NOT before 1976). The list of documents obtained would then be sorted and only genuinely relevant and non-restricted references (restricted documents would be withdrawn from the list) would be selected. Also eliminated would be documents, for example, existing in

another more recent or complete edition. The aim is not to submerge the user under a mass of documents but to select the few that are really relevant to his query.

Other search procedures help to refine and fill out the search formula:

1. *Weighting*: at both the indexing and searching stages each descriptor is attributed a coefficient which reflects its relative importance in the document and in the query.

Example: Regulations (3), Building (3), Dwellings (1), Tropical countries (3).

Since the query is given the same coefficient, the computer will retrieve only those documents indexed by the same descriptors and with the same weighting as in the formulation of the query.

2. *Proximity*: this fixes the distance in the text separating the descriptors utilized in the search. This method is employed mainly for free text searches (titles, abstracts, full text) or for abstracts incorporating descriptors. The operator can require two descriptors to follow each other: '*Boolean logic*'; to be contained in the same sentence: '*Boolean algebra as applied to the logic of information retrieval*'; or not to be separated from each other by more than a fixed number of words: '*the logic of Boole*'.
3. *Truncation*: a word can be retrieved by means of a group of letters, with prefixes or suffixes disregarded. For example, if the search is focused on the term 'Document', all the documents indexed by one of the following descriptors would be retrieved: 'Document, Documentalist, Documentation, Documentary'.
4. *Expansion*: the search formula is supplemented by giving instructions to add generic, specific or related terms. For example:
(Regulations + NT) AND (Tropical countries) would be translated by the computer into (Regulations OR Legislation OR Standard) AND (Tropical countries).
5. *Numerical comparison*: for searches involving quantitative criteria. For example, as the query asks for documents published from 1976 onwards one would put: 'Publication date > 1976'.

Search procedures

Search procedures can take a great many forms, depending on the circumstances. A distinction is drawn between direct search, that is to say by the user himself from sources at his disposal, and delegated search, which is performed by an information specialist at the request and on behalf of the user. Another distinction is between a search that begins by identifying the documents and/or sources and yields the actual information later, and one that obtains the information directly from a

competent individual or organization, or from a data bank or data collection, without having to consult the primary documents. In practice, these methods are often used together but the latter one has a very important place in the behaviour of most users.

In information units, the search is usually effected by means of a retrieval subsystem (indexes, files, etc.) which give access to a secondary document referring to the primary document.

Stages in information retrieval

The main stages are as follows:

The user becomes aware of a need for information and defines his need (subject, deadline, type of document or information wanted, in what form, in what languages, etc.).

The user decides on the sources to be approached.

Communication of the query: if necessary and if possible he discusses his query with his informant in order to clarify as far as possible all its aspects.

The query is formulated in the documentary language of each chosen source and the most appropriate search strategies and formulae (order and combination of descriptors) are determined in relation to the arrangement of each secondary source.

The information retrieval subsystem is searched for references (consultation of the files). If necessary, the search strategy is adjusted in the light of the intermediate results obtained.

The bibliographic records and possibly primary documents indicated by the references are assembled.

Screening, i.e. selection of the references that correspond most closely to the particular requirements of the query and to the main subject or secondary characteristics (date, language, type of document, etc.).

The user is informed of the search results.

The user checks the validity of the answer and, if need be, formulates a fresh query.

The user receives the primary documents selected.

The user extracts the information he needs from the primary documents.

The user estimates the relevance of the answer, assesses the efficiency of the service provided and communicates his opinion to the information unit (or source).

The information unit makes a final record of the query and of the user's opinion of the service, which will be acted upon in the appropriate manner.

In the case of direct search, the user carries out all or most of the operations himself, with the information unit simply assisting him, indicating sources and supplying the documents. When the search is delegated, however, the third step—communication of the query—is a very tricky one since there are many factors that can cause distortion (see Fig. 16), the danger of which increases to the extent that the dialogue between user and information specialist is less frank and trusting:

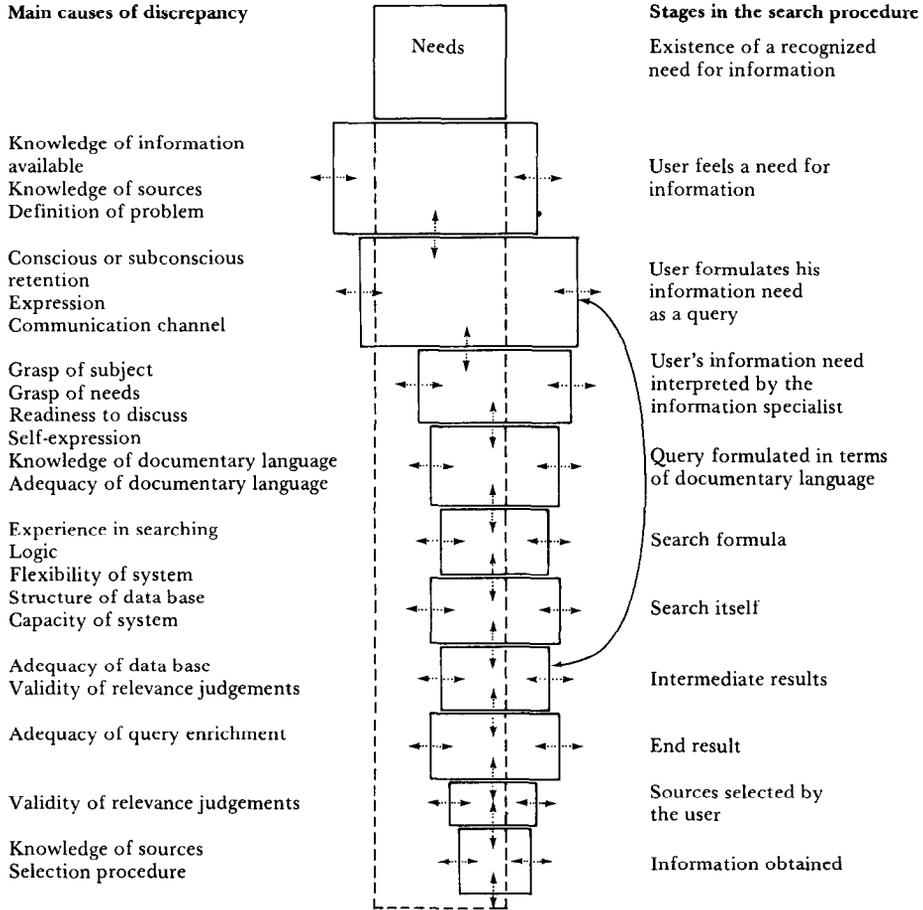


FIG. 16. Possible discrepancies between information needs and search results during the various stages of the search procedure.

The user is not very sure of his need for information and expresses himself rather clumsily.

He does not indicate, or does not reveal, the purpose and specific content of his query. He is not fully aware of the possibilities of the information unit or of the documentation sources he turns to; in particular, he may think that they cover a broader field or that they can provide more complete information or a more detailed answer.

The user and the information specialist fail to understand each other properly or to establish a co-operative relationship.

Information retrieval works to a considerable extent by trial and error but is more effective when the user and the information specialist have a good knowledge of the documentary sources and proceed systematically. In many cases, the key to success is a full and accurate definition of the query to start with: a well-formulated question is already well on the way to being answered.

Another point is that information is never sought for its own sake: it is sought for exploitation elsewhere under specific conditions. This is why these conditions must be clarified, in particular the following questions: Who is the inquirer? What use is he intending to make of the information? How much time does he have? What relevant documents does he already know and, in general, how much knowledge does he already have on the subject? What languages can he read? In what form would he prefer his information? Exactly what period of time or geographical region does the query cover?

The formulation of queries by users may turn out imprecise or ambiguous from various points of view. In the first place, the description of the subject may be too broad or too narrow. Secondly, in regard to the intended use of the information, the same subject can be dealt with in different ways in different types of document, one of which may be more suited to his purpose than another. For example, an article summarizing the main lines of a plan for economic and social development would provide an overview but could not serve for specific economic analysis. This would need the document containing the plan itself.

Thirdly, the conditions under which the information is going to be employed; it would be pointless to draw up a bibliography of around a hundred references and seek out the corresponding documents for an inquirer who has to produce a short synthesis of the subject within twenty-four hours. In other words, the most common type of question, 'what information have you got on such and such a subject?', should be rephrased as: 'Have you, on this subject, this type of information that will enable me to carry out this task under these conditions?'

The dialogue between the informant or information specialist and the user must enable queries of the first type to be converted into those of the second type and allow the subject to be narrowed down as much as possible.

Query enhancement is the term used to designate any procedure apart from the translation of the terms of the query into those of the documentary language, by means of which the query is rephrased so as to improve the chances of obtaining the desired result.

In brief, this comes down to realizing that a particular formulation will yield either too many or too few references, although this, of course, is not the only criterion for assessing the quality of a search.

There can be enhancement during the initial stage, during the search itself, or after a first attempt has failed to produce satisfactory results. A number of methods are employed:

The addition or deletion of a descriptor.

The replacement of a descriptor by a more general descriptor or a more specific descriptor.

The addition, deletion or transformation of a logical operator, i.e. modification of the search formula: for example, replacing the AND operator by the OR operator will yield more references.

The addition or deletion of links or roles (if these are used by the system).

The use of truncations, which makes it possible to find all the words that contain, either before or after a given group of letters, a specified number of letters (e.g. from 'CARB' one would obtain 'carbon', 'carbonate' and so on).

The splitting of queries into several separate questions.

The more carefully structured the documentary language, the easier it is to make these changes.

Computerized procedures have been developed for query enhancement but their role is limited by the fact that the relevance judgements are subjective; interactive retrieval systems can speed up and facilitate this process in a more satisfactory manner.

The indexing of queries follows the same general procedure as contents description (see Chapter 6). The problem is to find in the documentary language a number of descriptors whose level of precision corresponds to that of the terms used in the query—bearing in mind the particular structure of the documentary language—and which succeed in covering the concepts being sought. In most cases it is necessary to look through the systematic tables. For example, if one receives a query on the production of rice, one could find a descriptor Rice in the plants class and another descriptor Agriculture in the vegetable production class; the latter is the one to use. From another point of view, the indexing of documents is like dismantling or breaking down a subject in order to categorize it from various angles, whereas the indexing of queries consists in re-assembling or recombining scattered details in order to arrive at a statement of the subject. This means that several descriptors may have to be used to provide an accurate representation of a concept expressed in the query by a single term.

The user profile

The user profile is a search formula (i.e. an ordered set of descriptors) which indicates the information a user wants to receive on a regular basis from a selective

dissemination of information service. It describes the information relevant to his purposes over a reasonably long period of time.

There can be individual profiles, reflecting the needs of a single individual, or group profiles (or standard profiles) which correspond to the essential needs of a group of individuals of any size, engaged in a similar type of activity in the same subject field. Group profiles are obviously less precise than individual ones but the cost of a subscription is much lower. Profiles have to be established for each bibliographic data base in accordance with its particular structure and language.

A profile is constructed in essentially the same way as a search formula. However, special precautions are needed, since the profile will be utilized repeatedly over a fairly long period of time. If it had to be modified after each run the whole operation would become pointless, and if it were too narrow the search might not always produce results. The profile must be capable of selecting relevant documents but not too many of them.

In some cases, it is the user himself who constructs his profile with the aid of a handbook supplied by the unit providing the SDI service. It is more usual, however, for the profile to be constructed by a specially trained information specialist, who interviews the user at length and then submits trial profiles for his comments. The profile is then tested for a few runs, revised in the light of the results obtained and finally adopted.

Each set of results is sent to the user together with a request for his evaluation, so that any shortcomings can be quickly rectified. The user, of course, is invited to ask for his profile to be adjusted whenever his centres of interest change. Once or twice a year the information unit carries out a thorough check to make sure that the profile is still satisfactory and in conformity with user needs.

Access or search keys are the various characteristics of a piece of information or document which can be used for both retrieval and selection. The user expresses them in his query when he indicates the subject, dates, geographical region, type of document wanted, language, etc., but they also depend on the amount of detail in the bibliographic description and contents description (that is on whether such information is included in the data base) and on the flexibility of the retrieval subsystem (that is on whether or not the files or indexes can be sorted on the basis of these characteristics).

Access keys usually cover: (a) the subject dealt with; (b) the date of the information or documents; (c) the geographical region; (d) the author; and (e) the type of document (and hence the type of approach). But they can also cover the language, the number of pages, the document's accessibility, the number of a report or of a patent, place of publication, and so on. Some retrieval subsystems utilize only the name of the author and the indexing terms, while others can work from any element of the bibliographic record including the abstract. Some can accept only a limited number of search keys for the query as a whole or for each category of search key.

The recording of queries by the information unit can fulfil a number of important functions such as:

Avoiding the pointless repetition of searches already carried out.

Building up statistics on the functioning of the service.

Providing a basis for evaluating retrieval operations and for analysing the procedures used and their effectiveness.

Providing a basis for developing the documentary language, identifying needs and selecting documentary products, etc.

For this purpose, the record should contain as much data as can be collected without putting too much strain on users or staff, and in particular:

The origin of the query (name of the inquirer, date, channel of communication, intended use of the information).

The original formulation of the query by the user.

The documentary language version of the query and the search strategy and formula.

The data bases and sources used.

The time spent on each stage of the operation.

The search results (identification of the selected documents or indicated sources, form taken by the answer) and follow-up of the query (for example, provision of documents, drafting of a synthesis, etc.).

The user's evaluation.

All this can be set out on a single form to be filled in by the user and the staff and which can serve as both worksheet and archives document. A query file could be built up on the lines of document files in order to speed up retrieval operations (i.e. to check, before beginning a search that a similar search has not already been made).

The user's evaluation should be focused on the procedure and on the results, taking into consideration, for the procedure the amount of effort required, the response time, and to what extent the form of the response is satisfactory. As for the results, he should assess the relevance of the information supplied, the proportion of the information that is new to him, the proportion of irrelevant information and why it is irrelevant.

The search tools can vary widely, ranging from the traditional manual card files to computerized files designed for interactive search. The material and intellectual organization of these files involves different retrieval techniques but, although some are more complex than others, the basic procedure remains the same.

Types of retrieval

Retrieval by means of a catalogue or traditional bibliographic card file uses a single search criterion or key at a time, beginning with the most important concept and then narrowing down or broadening out the search with the aid of cross-references. Depending on the search criterion, use is made of the author or title file, the subject file (alphabetical or systematic) or a geographical file.

Retrieval by means of an index or printed catalogue follows the same procedure as for card-file catalogues. Speed of retrieval depends on the number of pre-coordinated concepts in the index and on how much information each entry gives on the document to which it refers. Nevertheless, this type of search is generally long and tiresome.

In either case the task is to find the subject headings corresponding to the significant terms of the query, for example, 'Regulations', 'Tropical countries', to examine all the cards or references under the entries concerned and then to make a selection by eliminating all the non-relevant documents. The existence of cross-references ('Regulations SEE ALSO Legislation') may well complicate the search. One always starts with the most important entries and everything (date, language, etc.) has to be properly checked.

Retrieval by means of a dictionary index of the Uniterm type takes less time. In this system, each descriptor has a card to itself on which the numbers of the document indexed by this descriptor are marked. These numbers refer to a bibliographic file containing all the information needed to retrieve the documents. The next step is to consult the primary documents themselves. The search therefore proceeds in three stages, which is cumbersome, but it does not take much time to compare the numbers on the cards of the relevant descriptors (see Fig. 17).

The numbers are recorded in ten columns, depending on the final digit. In the example we have been using (Building regulations for private dwellings in tropical countries but excluding administrative procedures), the search process would involve:

Regulations									
0	1	2	3	4	5	6	7	8	9
	71			144				88	

Building									
0	1	2	3	4	5	6	7	8	9
	71				25			88	

Tropical countries									
0	1	2	3	4	5	6	7	8	9
			43					88	

FIG. 17. Retrieval by dictionary index.

Taking the cards bearing descriptors identical or as close as possible to the terms of the query, i.e. those for 'Regulations', 'Building', 'Tropical countries', etc.

Selecting the numbers common to the various cards: 71, 88, etc.

Taking the card of the descriptor, 'Administrative procedures'.

Checking to see whether this card bears one of the numbers common to the other cards; if so, this number must be eliminated.

The numbers that remain are the only ones that are relevant. But the search should be narrowed down still further by eliminating from this set of references all those to be excluded for reasons of date (before 1976), language (French) or because the documents are restricted, etc.

Retrieval by means of an optical coincidence file, also known as a Peek-a-boo, follows the same principle. Each card bears the terms of a descriptor but the number of the document is not written down in the ordinary way as in the case of Uniterm cards; it is punched in accordance with its numerical co-ordinates (see appendix to Chapter 12).

The search process consists in taking all the cards corresponding to the descriptors used in the search formula out of the card file and piling them up in front of a source of light. The perforations that coincide can then be seen very clearly and they represent the numbers of the documents indexed with all the descriptors relating to the query. The operation is quick and easy to perform.

Retrieval by means of edge-notched cards is carried out as follows. First, the query is formulated with descriptors from the thesaurus, then the cards are sorted (by hand or with a mechanical device) according to each letter of each of the codes corresponding to the selected descriptors. The card-file is generally split up into batches of 100 to 150 cards and it is advisable to begin by looking for the most selective descriptor. Sorting takes longer than in the Peek-a-Boo system but the cards do not have to be arranged in any particular order and each card contains the main data elements of the document in question.

Computer-retrieval procedures

These procedures have to be adapted to the specific characteristics of the equipment installed, and in particular to its ability to handle very bulky files in a very short space of time, but there is no basic difference on the conceptual level, that is in regard to search strategies, between these devices and non-mechanized tools. The actual approach will depend on whether the computer is used on a fixed-time allocation or on direct access, for batch processing or on-line, on whether the information unit employs its own data base or relies on the resources of a computerized network, on whether the task is concerned with retrospective search or the selective dissemination of information, with producing a bibliographic bulletin or the answer to a specific query.

In fixed-time allocation, the information unit utilizes the computer only on

certain days at certain times. This means that all the search formulae, which are usually processed together, that is, in batches, have to be prepared beforehand, and this rules out the possibility of making immediate adjustments if the answer is not satisfactory. Moreover, any error or impropriety adds to the delay in providing an answer for the user.

When the computer is used on-line (i.e. with direct access), there is no delay worth mentioning and the search formulae can be modified in the light of the results as they appear. But this method needs a thorough knowledge of the data base and its documentary language, since successive attempts and hesitations take up more computer time, whose cost is borne by the unit. In practice, it is better to prepare the search strategies carefully beforehand.

In batch processing, a varying number of queries are processed together, that is, the search turns up all the documents identified by a search key mentioned in one or several queries. This approach rules out changes in strategy while the search is going on but does reduce the amount of computer time utilized and hence the cost. When an internal data base is employed, its organization and access tools are usually well known, and direct access to it is usually possible. On the other hand, in a system exploiting several different data bases, differences in structure, documentary language and access tools have to be coped with; the same query would have to be formulated in the appropriate way for each data base. This requires adequate familiarity with all of them. The problem is rather like having to converse with several people in different languages at the same time. In a network, moreover, certain special procedures have to be carried out in advance in order to gain access to the computer and then utilize the commands peculiar to the system to execute the search operations.

Retrospective search involves comparing a great many records with a small number of search keys, whereas processing for selective dissemination uses quite a small data base and a relatively large number of search keys. These contrasting conditions call for different logic in regard to processing and file structure.

When producing bibliographic bulletins with a fairly large number of references, it is not always possible to include all the search keys in the indexes, because the latter would become too bulky. Those that are too narrow have to be rejected or stopped. The particular exigencies of publishing programmes must also be borne in mind. A single isolated inquiry, on the other hand, can make use of all the possibilities offered by the data base and computer system.

Depending on the computer system and its retrieval software, moreover, the search may be restricted to certain data fields and a fixed number of search keys and logical operations.

As we shall see, computer retrieval procedures can show other marked differences which depend on whether the file employed is sequential or inverted and on whether or not the system is interactive.

Retrieval with a sequential file: here each search formula is compared with the search keys contained in the records of the bibliographic descriptions. Since these are arranged in order of accession number, it is necessary to read the

whole file to carry out the search. The records pertaining to the query are extracted from the sequential file and transcribed on a working file for subsequent sorting and printing. The bigger the file the longer this procedure takes.

Retrieval with an inverted file (see Fig. 18.): in this case, the search keys in the queries are compared with those which have been entered in the inverted file from the bibliographic records. The inverted file contains a list of all the search keys existing in the data base that are accepted by the system, generally arranged in alphabetical order; each key is followed by the accession numbers of the documents which contain it. The bibliographic records are on a separate file.

The numbers of the documents corresponding to each key are placed on a working file which is then utilized to carry out the logical operations specified by the search formula. Having found the numbers of the documents selected, it is possible to turn to the bibliographic file and extract the records, which will be passed on to the user.

This method is usually quicker than the preceding one but makes it necessary to handle two files whose maintenance is more complicated.

Interactive retrieval takes place on-line, generally through a visual-display terminal. Its distinctive feature is that the user (or the person acting for him) can dialogue with the computer and so adapt his search strategy whenever necessary or change the way it operates. But the longer the search, and above all the more hesitant the approach, the more computer time is required—and this is expensive. The technique is still too new for the cases to which it is best suited to be specified.

Once he has prepared his research strategy, the user asks to be connected to the computer system and relevant data base. He then utilizes his selected search keys one after the other and the system indicates the number of records which contain them. By applying the logical operators he can now discover the quantitative results of his search, which will enable him to narrow down or broaden out the query formulation with the help of the documentary language, also accessible on-line.

After an elementary operation of selection (searching for documents indexed by a descriptor or combination of two descriptors, for example) the user can have the corresponding records displayed. Their examination will help him, for instance, to refine his query further (choosing access keys that are related or hierarchically linked to the ones he has been using).

Each stage in the implementation of the search strategy is saved for consultation at any moment. When the user has finished the selection phase he asks for the records to be displayed and calls a halt as soon as he feels he has enough information. He can also ask for the list of records to be printed immediately or sent to him later, the latter course benefiting from a lower tariff.

Free text searching is possible with certain systems. This technique enables the user to sort either all the records, which may contain the bibliographic record and even the full text of documents, or certain natural-language elements such as the title or abstract.

In certain cases, the records of the documents have been fed into the computer without any indexing. In others, they have been indexed with a documentary

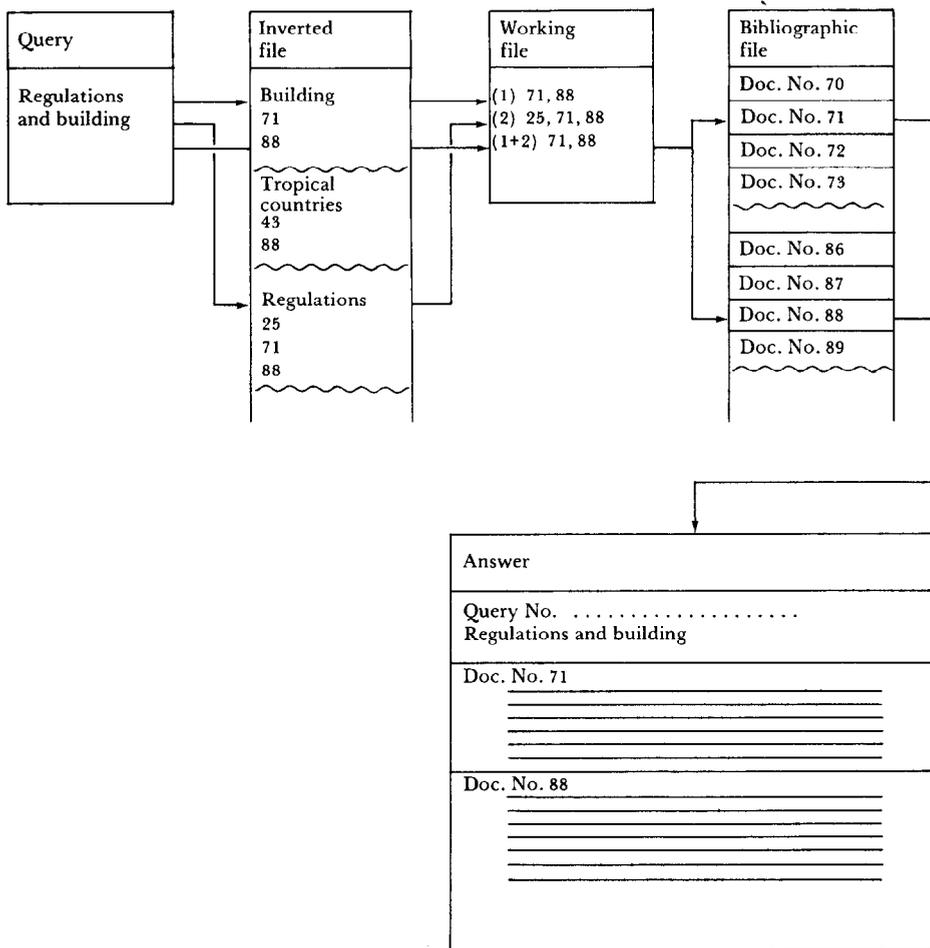


FIG. 18. Search by means of an inverted file.

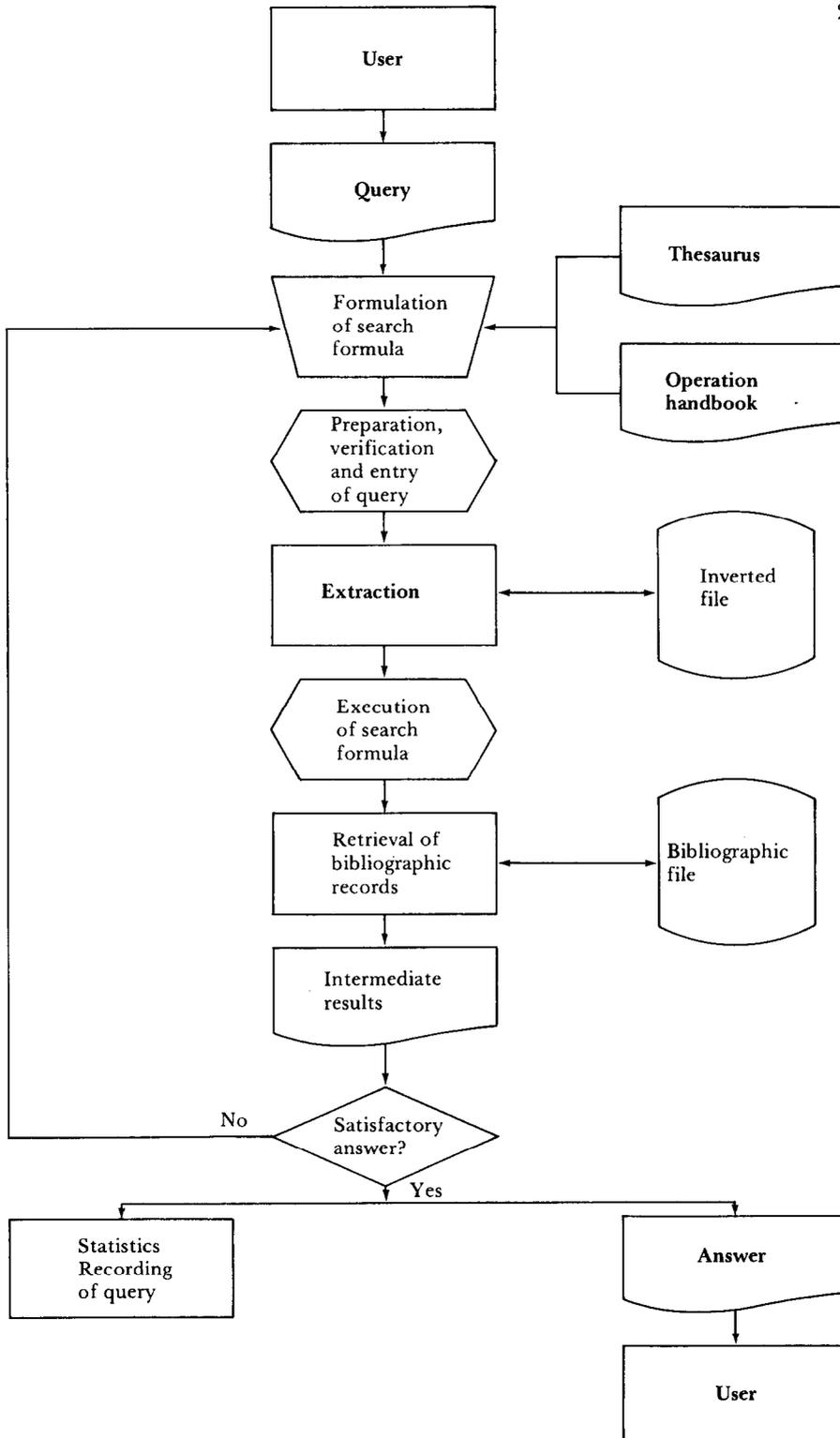


FIG. 19. Diagram of a search procedure.

language, making it possible to conduct the search at both levels, one of which—usually the free text search—is employed to refine the results of the other.

Once the query has been defined, the problem is to identify all the terms of the natural language which could have been used to express the concepts covered by the terms of the query. For example, if the query contains the term 'Private dwelling' the user would have to look up 'Habitation', 'Home', 'House', etc., as well. He must then work out his search formula, which has to be arranged very carefully in order to limit possible confusion arising from the different meanings of natural-language words and the number of terms. This explains why many of these systems utilize logical operators, such as proximity, co-occurrence and truncation, in addition to the Boolean operators, AND, OR and NOT.

Check questionnaire

What is a 'search procedure'?

List the main types of search procedure.

What is a 'user profile'?

How is a Peek-a-Boo-type search carried out?

What is the difference between sequential access and direct access?

What is the distinguishing feature of interactive search by computer?

What are the three possible types of relation between descriptors that are characteristic of a search procedure?

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15 Evaluation of information storage and retrieval systems

Evaluation of information storage and retrieval systems is the operation whereby various parameters are used to measure a system's actual capacity to retrieve the documents, or their references that provide the answer to search questions. Normally, every query concerning the field covered by the system will receive an answer, but how effective is the system? Is the answer as comprehensive and relevant as possible? The second question concerns the cost of this effectiveness (cost-effectiveness evaluation): how can the cost of this system be reduced while increasing its effectiveness? Thirdly, do the benefits obtained justify the cost (cost-benefit evaluation)? Evaluations can seek to clarify how the system operates or—much more interesting in practice—to find out why it functions at a particular level of efficiency.

Effectiveness

Effectiveness is measured as in Figure 20. The two main parameters are the recall ratio and the precision ratio.

The recall ratio is the proportion of relevant documents retrieved in relation to the total number of relevant documents in the system. If, for example, out of a data base containing 100 references, 20 are relevant to a query and the system retrieves 15 but omits the other 5, the recall ratio is 15:20 or 75 percent. The relevant documents which the system has failed to retrieve constitute what is known as 'silence'.

The precision ratio is the proportion of relevant documents in relation to the total number of documents retrieved by the search. If a search produces 40 references of which 15 are relevant, the precision ratio will be 15:40 or 37.5 per cent. The term 'noise' is used for the 25 non-relevant documents supplied at the same time.

Recall and precision are contradictory qualities. The narrower the search, the greater the risk of it failing to select possibly relevant documents which have been described in more general terms; in other words, recall diminishes and silence increases. Conversely, the broader the search, i.e. the more it is aimed at retrieving the maximum number of documents however slightly they are related to

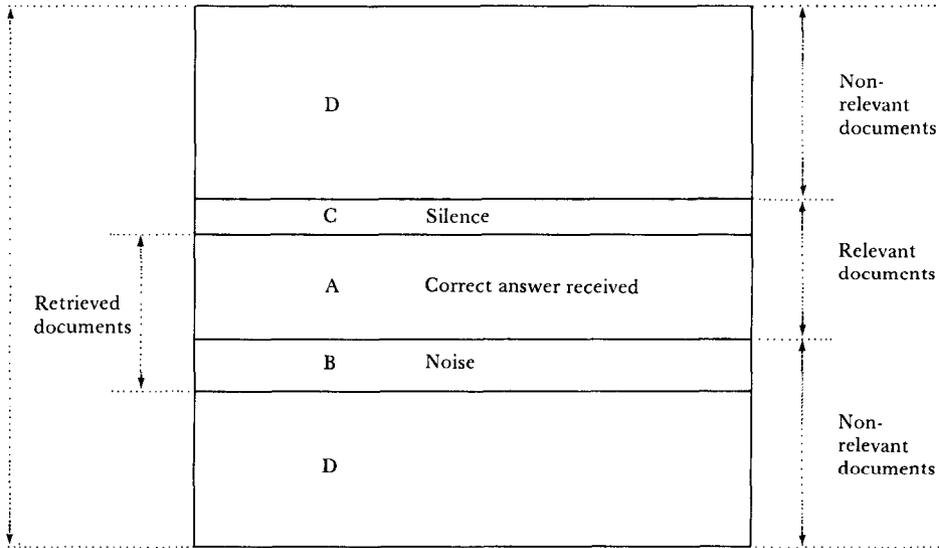


FIG. 20. Main parameters for the evaluation of a retrieval system.

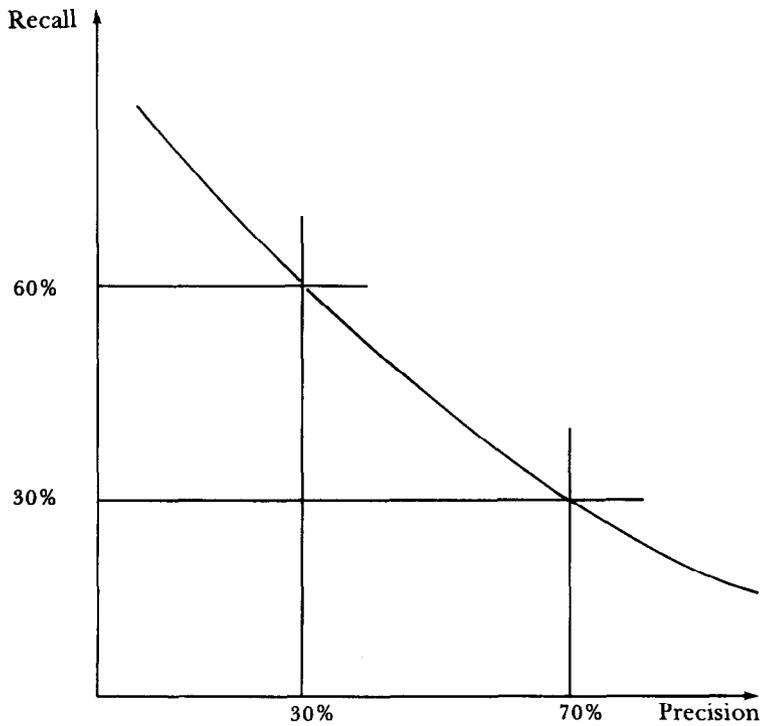


FIG. 21. Performance curve.

the subject, the more likely these documents are to be mingled with non-relevant ones, resulting in less precision and more noise. The recall-precision relation follows a curve normally shaped as in Figure 21.

Other measurements of effectiveness are:

The fallout ratio, which is the proportion of non-relevant documents retrieved in relation to the total number of non-relevant documents in the data base.

Selectivity, which is the proportion of non-relevant documents not retrieved (i.e. correctly eliminated) in relation to the total number of non-relevant documents.

(These two ratios indicate the precision of the system from the opposite point of view, namely its ability to limit noise.)

Specificity, or generality, which is the proportion of relevant documents in relation to the total number of documents. This has a direct bearing on retrieval: the more the collection extends beyond the field covered by the query, the greater the risk of silence and noise.

The response time is the time taken for the query to obtain an answer. With given recall and precision ratios, the shorter the response time the more satisfactory the system.

User effort is measured by the time he spends on conducting a search for himself or on arranging to have it done for him and then, after receiving the results, on sorting out the relevant documents. Here again, quality being equal, the less effort required the better the system.

The coverage ratio is the proportion of documents included in the data base which concern the subject of the query. Even if recall were to achieve the most extraordinary ratio of 100 per cent, the system itself is unlikely to include all existing documents; if it includes only half of them—though this would be difficult to determine accurately—actual retrieval would in fact be only 50 per cent complete.

The novelty ratio is the proportion of documents mentioned in the response that were not already known to the user: the higher this ratio the more effectively the system is performing its essential function. This criterion is particularly important for searches of current information.

Performance evaluation: here the methods employed depend on the type of system, its objectives, and the conditions under which the evaluation is conducted.

Evaluation can be focused on the searches conducted in the various systems or on the documentary products, or on the role of these services and products as retrieval tools: for instance, to decide whether or not they should be acquired. But evaluation could also be based on a representative sample of recently completed or ongoing searches, or on a laboratory experiment with a perfectly familiar portion of the collection and by evaluators whose assessment could be checked. This approach offers greater precision but creates an artificial situation that is highly misleading.

Response time and user effort can be observed and recorded quite easily with the co-operation of the users, who would gauge precision and novelty by filling in

the forms provided with each reference supplied in response to their queries. Every effort should be made to ascertain the reasons for their judgements. Calculation of the recall ratio is the most delicate operation unless one is dealing with an artificial situation; a simple way of assessing this parameter is to arrange for the same search to be repeated by different people, to gather in all the results and to compare them with those of the initial search. Similar approximations based on comparison could be used to look into coverage, for example by searching in a data base or documentary product for the documents included in the bibliographies of several important review articles.

The problem of evaluation has given rise to a great deal of research, which offers some useful guidelines. A general rule is that the methods of evaluation should always relate to the final objective and in particular be capable of measuring the potential improvements to the system.

As for the concept of relevance, this is still a somewhat controversial subject in that it depends on the individual judgement of the user, who does not always make his reasons clear. Yet it is this judgement, such as it is, which determines user satisfaction.

Main causes of failure

The main causes of failure, where information storage and retrieval systems are concerned, have generally been analysed in relation to the two main criteria of performance, namely, recall and precision. Failures can be due to faults in the documentary language, the contents description, the search procedure, the user-system interaction, the utilization of search devices, and to clerical errors. The type of clerical error varies considerably from one system to another, for example, mistakes in the transcription of bibliographic records, in the search formulae (omissions or faulty spelling) or in filing.

Failures arising from the utilization of search devices are not usually very serious. They may be due to the equipment itself (poor access to the files, poor application of the search procedures, the wear and tear of carriers) or to the way it is handled (files not properly maintained).

More numerous failures—and more difficult to discern and put right—are connected with the user's decisions and his interaction with the system. If the query is more specific than the actual information need, recall will be inadequate; conversely, if the query is too general the response will lack precision. Everything depends on the clarity with which the user formulates his query, on his means of communication with the system and on the methods used by the system's staff to ascertain the user's needs. Sometimes, moreover, the user rejects documents that are perfectly relevant to his query because he thinks they are inappropriate. The indexing language will occasion recall deficiency if certain specific terms are missing (descriptors or controlled synonyms), if the hierarchic structure or the relations

are inadequate, or if the syntactic indicators lead to excessive precision. It will cause precision deficiency if the descriptors are not specific enough, if the hierarchic structure is not sufficiently developed or if there are errors in pre-coordination or in the relations.

Contents description produces poor recall through lack of specificity, lack of exhaustivity, the omission of important concepts or the use of inaccurate terms, and low precision when it is too exhaustive or when the terms used are wrong.

The search formula can adversely affect recall if it fails to cover all possible aspects of the query or is worded in too specific or too exhaustive a manner (not enough documents will be found satisfying all the criteria); on the other hand, precision suffers when the formula is not specific or exhaustive enough, when it uses unsatisfactory terms or combinations of terms, or when the logic is faulty.

The costs of a storage and retrieval system can be broken down into those relating to acquisition, processing and storage (production of secondary information), the creation and maintenance of the retrieval system, the processing of queries, the utilization of search devices and of equipment for printing and communicating the results, verification, and the selection of relevant documents.

The first item is staff costs (salaries and social insurance) which can be assessed in relation to the time spent on each operation. Other items are material costs relating to the renting or depreciation of storage or retrieval equipment, their running costs (machine time), data-entry devices, printing equipment and communication facilities (the renting of telephone lines, for example). Material costs also include general supplies but above all the acquisition of primary documents or data bases. Lastly, the general overheads (premises, insurance, upkeep, electricity, general services, etc.) have to be calculated in proportion to the number of personnel employed in retrieval, unless the services concerned are provided by a separate department which would then be directly responsible for some of the expenditure incurred. Costs can be worked out from the book-keeping records of overall expenditure and from the records of transactions (time spent, number of documentary units processed, number of searches undertaken, number of references supplied, etc.).

Cost-effectiveness

The evaluation of cost-effectiveness is impossible without prior knowledge of the performance and cost of the system. It shows whether performance can be improved at an acceptable cost, or at no cost, or whether costs can be reduced without unduly affecting performance.

In any case, it is desirable to define a unit of cost, which can be the search, the profile or the retrieved reference. However, the most suitable unit of cost is the relevant reference found for the user since this takes the system's performance into account.

Generally speaking, costs tend to rise with the number of documents processed and particularly with the exhaustivity of the search process. On the other hand, costs can be reduced by a more rigorous acquisition policy based on an examination of the distribution of sources among the retrieved references.

As for contents description, the potential improvement in performance as a result of a given rise in exhaustivity can be estimated by means of tests on a representative sample of already analysed documents and queries.

The more specific the documentary language, the more expensive it is to handle and develop. Its degree of specificity should therefore correspond to the desired level of performance, bearing in mind the present and foreseeable size of the collections (as collections grow the language has to become more discriminating).

Where search procedures are concerned, one possibility is to reorganize the service, either by separating search activities from the other functions of the information unit or, on the contrary, by seeing that they are effectively integrated. Another is to cut down the time spent on discussing queries with the user or on screening the results.

It is also possible to analyse clerical operations in order to identify the main causes of error, such as in the transcription of numbers or intermediate data.

Equipment costs generally include the cost of installation, depreciation and utilization and take into account the type of operation and the type of product the equipment makes possible. For example, a system giving access to abstracts can tolerate a lower precision ratio because the selection of relevant references is much quicker and easier to handle than in the case of a system that provides citations only.

It usually transpires that the same performance objective can be attained by different means and accordingly the least expensive should be chosen. It will be found that savings can be made more easily on the input side, but care must be taken to ensure that changes here do not complicate the search procedures.

Cost-benefit evaluations

Cost-benefit evaluations are never easy to handle because the direct benefits of a retrieval service are difficult to identify and measure.

It is however possible to compare the cost of the service with the cost of obtaining the same information by some other means. Another method is to estimate the time gained or the increase in productivity resulting from the use of the service, even if this can only be done by estimating losses owing to the lack of such a service. The existence of an information service may also allow an organization to reduce the number of its staff or to employ staff with lower qualifications.

If such evaluations prove impossible, it is always possible to seek the opinions of users by means of a questionnaire or interview designed to find out how satisfied they are with the service and to obtain their own assessment of the benefits they have derived. This said, however, every effort should be made to arrange for regular

evaluations so as to ensure that the system functions satisfactorily and is of real value to those for whom it was designed.

Check questionnaire

What is the purpose of evaluating an information storage and retrieval system?

What is recall?

What is noise?

What are the chief causes of the poor performance of an information storage and retrieval system?

How is cost-effectiveness measured?

How is the cost of a storage system assessed?

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16 Types of information unit and networks

The institutions developed by human societies came at a very early stage to include organizations specialized in the conservation and arrangement of documents so as to facilitate access to the knowledge they contained. Even in ancient times there existed remarkably organized libraries and archives, though the only people able to use them were the ruling class and the educated. With progress in education and social organization they grew and attracted a broader public. Yet, almost up to the twentieth century, their activities were still centred on the handling of documents, even though certain other forms of documentation, such as current secondary publications, had first appeared as far back as the eighteenth century.

The modern era has seen an increase in the number and variety of users, a rapid expansion of supply and demand as regards information and new techniques for treating it with an ever-increasing refinement. One consequence has been the proliferation of organizations specialized in information activities which stress other functions of the documentary chain—contents description, data extraction and processing, the dissemination of information, etc.—and do this for particular groups of people. They are known as documentation centres, information centres, data banks, etc. and it is now quite common to distinguish them from, and even contrast them with, the traditional centres. The latter, at least in the most active cases, have also ventured into these new activities or approaches.

The range of information units is complicated by the diversity of titles (and by their ambiguity) and by the variety of their activities. We shall attempt to distinguish the different types and classify them according to a number of criteria.

The most important criterion is the kind of information activity on which they tend to concentrate; to simplify matters, three kinds of information activity may be said to coexist: (a) the conservation and provision of primary documents (archives, libraries, media centres); (b) the contents description of documents and its dissemination, and the signalling of information and sources (documentation); and (c) the answering of queries by the exploitation of available information, including its evaluation and transformation (information).

These three areas correspond to increasingly sophisticated types of product. In practice, it is not always easy to make distinctions along these lines because

every information unit is necessarily active in all three areas, at least to a certain extent. Many units in fact cover more than one area.

The other criteria concern the field in which the information unit operates (science, culture, etc.), the types of documents or sources used and the public served. Here again, in practice, information units may well emphasize one aspect without necessarily excluding the others. The fact is that any information unit trying to respond to user needs will gradually develop a broad range of activities which cut across the above categories. At the same time, the present state of information activities and the tendency towards specialization are making information units more dependent on each other in their efforts to provide users with all the services they require. This interdependence is gradually developing into formal networks.

Information units centred on primary documents

These units collect, organize and preserve primary documents and make them available, whatever their nature, to users. In most cases the users have to come to the unit to obtain what they want, and description of the documents is confined to identifying them as physical objects and providing an often very brief indication as to their subject. Depending on their official status, these units cater for different types of public and their documents are made available in different ways. They are usually organized into technical services (acquisition, cataloguing, workshop, etc.) and user services (loans, references, etc.).

An increasing number of these units now offer many other services, such as the reproduction of documents, retrospective searches—sometimes by means of a terminal connected to computerized information network—referral and question-answer services, etc. They also serve as a venue for lectures, exhibitions and other events.

The national archives are a state institution whose function is to receive, preserve and make available to authorized users the documents of national and local public administration and possibly of public companies, private organizations and individual people. They are governed by special laws and administrative regulations. Documents can only be communicated to the public after a certain lapse of time (usually thirty years) and under certain conditions. The archives have to discard documents of no importance and keep the others, taking care to make their origin clear. They make extensive use of microfilm, for obvious reasons of space and security. They often have to deal with the filing and maintenance of records being used in government departments (documents a few years old).

The archives of 'technical' departments (health, public works, agriculture, industry, etc.) are often of great interest for the scientific and technical information they contain.

Business archives conserve the internal documents of an organization.

The strictness of the rules governing their operation and utilization depends on how much importance the organization concerned attaches to the role of information. Many organizations dispense with archives altogether or regard them as a mere depository, even though they could be of great service in many branches of activity. In most cases, they can be utilized only by staff of the parent organization.

The national library is a state institution whose function is to acquire, process, conserve and make available to the public copies of all the documents published in the country and sometimes copies of those, wherever they come from, dealing with the country or relevant to national activities. It is often responsible for the national bibliography and, in many cases, also plays a leading role in technical matters and even on the organizational level in respect of all the libraries in the country. Some national libraries have highly specialized departments, some of which may be decentralized.

Public libraries are institutions run by the state or the local authorities. Their collections serve the cultural, recreational or practical needs of the local community. Some have branches in each district of a city or in various rural towns, and many organize special sections for various categories of reader such as children, teenagers, the elderly and minority groups.

In developing countries, they can make an important contribution to development, help consolidate literacy and serve as an indispensable source of information, even in technical subjects, for regions with no other facilities.

Public libraries for the social groups mentioned above can also be found as independent bodies. In some countries, for example, rural libraries are run as a separate system. This kind of specialization simplifies administration, since such libraries can concentrate on the particular needs and characteristics of the social group concerned.

Central lending libraries are public libraries which provide a loan service for areas without a local library. For this they have quite large holdings and generally double as a normal public library in their own area. Some loan services are centralized and lend documents by correspondence, some make use of depositories that are open to the public at certain times, while others work through mobile libraries, which are vehicles especially equipped to bring the documents to the reader. The mobile-library system can provide an excellent basic service covering all information activities, including scientific and technical information, for developing countries which lack an established network, especially in rural areas.

University (or academic) libraries are to be found in universities and other institutions of higher education. Like public libraries they possess large collections which, however, tend to be more thorough, more specialized and often very complete, where the various scientific and technical subject fields taught are concerned. They are primarily for teachers and students but some are open to other members of the public (at least for reference purposes and on-site consultation). Some universities have a single library, possibly divided into sections (science, medicine, social sciences, humanities, etc.) while others possess a central library in addition to departmental libraries for each discipline, or highly specialized libraries. Research libraries, which are often linked to or merged with university

libraries, contain highly specialized scientific holdings for the use of research institutes or groups. Research institutes not connected with universities also of course have their own libraries, which in this case constitute a type of special library.

School libraries are located in primary and secondary schools for the use of pupils, teachers and staff. Their collections are designed to back up the course of studies and provide recreational reading. Active teaching methods are tending to turn them into a study tool and source of information on a wide range of subjects. They play a vital role in introducing students to the techniques of information. Unfortunately, they are still very rudimentary in many countries.

Special libraries take a number of forms, depending on what they specialize in. Some concentrate on a single discipline or field of knowledge and are open to the general public; some deal only with a single type of document (official publications, patents, standards, etc.) and they too may be open to anyone, while others, specialized in a particular field, are restricted to certain categories of user, usually members of the organization to which they belong and sometimes authorized persons.

To meet user needs, which are assumed to be very precise, these libraries are drawn into sophisticated documentation (indexing of documents) and information activities (question-answer service, information analysis, etc.).

Libraries of organizations or firms, including private libraries, are distinguished by the fact that they serve a small group of people and are normally reserved for their exclusive use. They may have a recreational or professional purpose, or both, and differ widely in the services they provide.

Audio-visual libraries are information units dealing with audio-visual documents. There exist various types: photographic libraries, for still photographs and slides; film libraries; video libraries, for video recordings; newspaper libraries, which also collect posters, leaflets, handbills, etc.; map libraries, for maps and plans, and record libraries. This type of unit sometimes functions as a separate section within a library or archives. When audio-visual and normal libraries are merged, they are called 'media centres'.

Information units centred on contents description: their main purpose is to identify as accurately as possible all information of potential interest to users, to see that they receive this information, to help them find the primary documents concerned, and to answer their queries. In other words, unlike the previous types of unit, their usual task is to anticipate user needs.

In theory, they could simply build up files of bibliographic and contents descriptions without stocking the primary documents themselves, but in practice the specialized units at least provide a library service in addition.

They are organized in many different ways, depending on their field of interest, clientele, status and size. Some are run by a single person while others may have several dozen staff or, as with the major access services, several thousand employees.

These units generally comprise a management, possibly a library, and processing services that may or may not be associated with retrieval, publication and technical services (such as reprography).

Small documentation units, run by a single professional documentalist

and one or two other staff, are very common. They work for organizations of various sizes or even for the divisions of an organization (for example, a research institute and its various laboratories), serving a generally small group of highly specialized professional staff. They have no freedom of action.

Documentation centres

Documentation centres of organizations are often bigger, especially in large companies and in sectors where production depends upon access to economic and technological information. Some have more freedom of action than others but they operate exclusively for the members of the organization to which they belong, except occasionally in the case of public undertakings.

Certain documentation centres in the private sector, but more in the public sector, sooner or later acquire a large measure of autonomy and even full independence, and end up by working for all specialists in their particular field both in the country concerned and abroad. This is particularly true of access services which analyse and index the most important literature in a frequently broad field (chemistry, biology, engineering, etc.), producing bulletins and machine-readable files for sale to subscribers. They are run as commercial undertakings and many of them have considerable resources. A similar type of undertaking (e.g. the System Development Corporation of Lockheed in the United States, or the European Space Agency in Western Europe) sells on-line searching of the data bases produced by the preceding type of documentation centre. In recent years, a number of firms, some of them quite large, have been set up to sell information services to order.

National documentation centres are state institutions covering all subject fields and serving all users. Their function is to collect and process all documents produced in the country and in some cases those dealing with the country. Some of them also cover international literature in all fields of knowledge, or at least in those relevant to the national scientific and technical activities (for example, the documentation centre of the CNRS in France and that of the VINITI in the USSR). When the scale and scope of their documentation activities have grown to considerable proportions, these centres are organized as a decentralized network of specialized units.

Many countries have sectoral national documentation centres (for agriculture, the various branches of industry, etc.) which come under public or semi-public bodies. They sometimes form the nucleus of encyclopedic national centres and often act as the national correspondent of international systems.

Information units centred on question–answering services and the exploitation of information are often called ‘information centres’ but can take a wide variety of forms. They normally run libraries, archives and documentation centres either to inform users where they can obtain the information they need or, more often, to prepare the answers to queries. In some cases, they even serve as consultants who work out the solution to problems raised.

Some units of this type reprocess primary and secondary documents or compendia of data in order to have available more refined data bases that can respond immediately to the needs for which they were created.

Although they are equally concerned with library and documentation services, some of these centres (referral centres, clearing houses, question-answering services, etc.) will be examined in Chapter 17, along with services engaged in the dissemination of information. Most of the units in this category are extremely specialized and are staffed by specialists highly qualified in the fields they cover.

Information analysis centres

Information analysis centres are an advanced form of information centre whose special role requires them to be attached to research centres. This is because their function is not so much to facilitate access to documents or information as to evaluate current knowledge on specific subjects (the mechanical properties of certain alloys, for example), to produce regular or especially commissioned syntheses, and to provide directly usable information (for example, whether a particular alloy can be employed in certain conditions). These centres often have to verify experimentally the information they have gathered. They also play an important role in stimulating research of pin-pointing gaps in knowledge or shortcomings. Their work entails as much attention to factual data as to specialist literature.

Data centres serve to collect, arrange and store for use when needed numerical data pertaining to particular subject fields or specific types of question (e.g. on the toxicity of certain chemical products). An even more advanced form of this type of information unit are the data consolidation and evaluation centres, which check systematically all available data and organize them into a number of categories for the purpose of showing the current state of knowledge (together with comments on the precision or reliability of the data) in regard to the various aspects of a product or phenomenon.

Data banks

Data banks are usually concerned with a broader field (the counter-indications of medicines or town planning data, for example). They use very precise grids to extract the raw data from data collections and the relevant literature, which they arrange in structured files so as to be ready for subsequent processing to answer user queries like: Is such and such a medicine dangerous for a patient with these symptoms, and if so at what dosage? This means that their services can be used directly for decision-making or a piece of research, obviating the need to consult primary documents or other sources of information.

There is a new trend to broaden their scope by linking them with systems

designed to simulate and assist decision-making, with the result that the answers they give are no longer focused on the initial situation but on the possible consequences of the intended course of action.

Liaison services send specialists to the users to identify problems encountered in the course of their activities, to decide what information is needed for their solution, to put them in touch with the sources and to provide an appropriate solution by exploiting these sources on their behalf. This work sometimes takes the form of a current information service but in most cases its purpose is to find the solution to a specific problem. Services of this type are sometimes called 'extension services'; they are in fact, however, much more concerned with advice and technical assistance, though it is certainly one of their functions to popularize knowledge. Most of them serve industrial and agricultural undertakings, and they are usually run by the public authorities or local bodies such as the Chamber of Commerce and Industry.

Information networks

Information networks are comprised of a group of individuals or organizations that exchange information in various forms but on a regular and organized basis.

Interpersonal and interorganization networks grew out of the need to obtain, communicate and check information: in short, the need for exchange. Their final objective being to ease the burden of each member, share tasks and pool resources, they have to be given a formal structure (that is, there must be a formal agreement between members of the network) and establish common procedures that take their several needs and the techniques employed into consideration. The participating units thus create a special information system between themselves, called either a 'system' or a 'network'.

Even though it is perfectly natural and inevitable for units to exchange information, the creation, development and maintenance of an efficient organized network is not a simple matter. The conditions must be favourable, a number of obstacles overcome and a great deal of effort expended. Like any collective undertaking, it is set up on a permanent basis.

The first requirement is a recognized convergence of interests between a number of information units in regard to their objectives and fields of activity. All the members must then fully appreciate the advantages of creating a network; in other words, they must recognize the potential benefits and realize that these benefits will not only make up for previous gaps but offset the constraints of the system itself. The units involved should be of roughly the same size or, if one member happens to be in a dominant position, this must be accepted by all parties. The network must already or potentially have at its disposal technical resources that are within the capability of all participants.

The functions of networks range from straightforward occasional collabora-

tion (reciprocal access to each other's services) to the full integration of the participating units in a single information system covering all documentary functions and sharing all costs. There are, of course, various intermediate situations.

Some networks are based on a particular territorial unit—a city, region or country—so that their members can, as a group, meet the needs of all categories of users in the area concerned. Others are specialized, in particular documentary functions such as acquisition, cataloguing, loans, indexing and abstracting, the creation of a shared data base, on-line retrieval, question-answer services and so forth.

There exist networks specialized in a particular discipline or branch of activity all of whose member units join together to reinforce each other's services and sometimes to harmonize their procedures and products. Others specialize in serving a particular category of user such as small firms, coffee producers, etc.

A single network can naturally combine these different functions, just as networks of different types can co-operate or be interconnected (an on-line retrieval network and a network of libraries, for instance).

As a result of the development of telecommunication networks for data transmission, an increasing number of information networks (suppliers of services) are linking up with these suppliers of a channel of communication. The appendices to Chapter 18 give some examples of these networks, particularly national and international ones, and show how they have developed.

The structure (or configuration) of networks is an important consideration, since it affects the manner in which the information is communicated, that is, how it actually circulates. There are various possibilities: there are decentralized networks, in which all member units communicate directly with each other. They have more communication channels and the links are often more direct but management of the system is more difficult. This type is illustrated by the interlibrary loan networks. There are also centralized networks, in which the units communicate through a centre. The system is hierarchical and an example would be a central library with its associated libraries or branches. Finally there are mixed networks, in which certain functions or certain geographical sectors are decentralized and others centralized.

These different types of structure are represented in Figure 22.

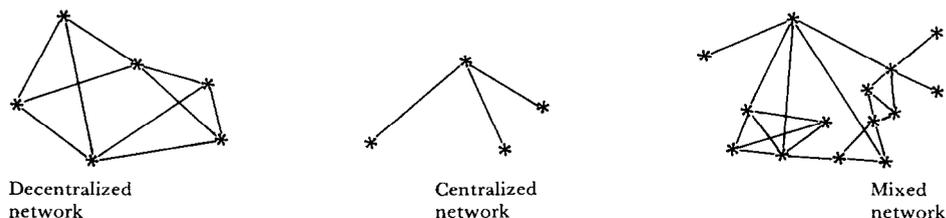


FIG. 22. Network structures.

Check questionnaire

What are the various types of library?

What are the main types of organization handling documents?

What is a media centre? What is a record library?

What is a tertiary document? Give some of the main types.

What is the purpose of a network?

What are the possible structures of a network?

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17 Services for the dissemination of information

The dissemination of information consists either of supplying the user with the information he needs or of giving him an opportunity to gain access to it. Being the final stage in the processing of documents and information, it usually comes at the end of the documentary chain. There are, however, certain forms of dissemination that can take place immediately after production of the documents, with or without the intervention of information units.

Since the dissemination of information constitutes the *raison d'être* of information units, it must be their central concern. The conservation of documents is in fact one of the means to achieve this end. Dissemination can involve: (a) the primary document itself (or a copy); (b) the reference of the document in 'secondary products' of various types; (c) the information contained in the document, presented in various 'tertiary' products; and (d) the sources of information.

Forms of dissemination

The forms of dissemination may be classified by the carrier employed, periodicity, scope and the initiative required of the user. The first type of dissemination that comes to mind is the text itself, either reproduced in regularly issued documents such as information or bibliographic bulletins or recorded on magnetic memories and consulted through a computer (a print-out or visual display). But oral diffusion is important too, either from person to person (information passed on by word of mouth or by telephone, information recorded on a telephonic answering machine or an audio cassette or by means of interviews) or in groups (lectures, information meetings, site visits, courses, etc.).

Audio-visual techniques such as films or slides are also used to disseminate information. This method presupposes that the unit is equipped to produce them or is able to have them produced, and that the users have appropriate reading devices.

Lastly, exhibitions can be organized which utilize all these means: the distribution of documents, personal contacts, audio-visual displays, the presentation of equipment, and posters accompanied by selected texts and graphs.

Dissemination may be organized on an occasional or a regular basis. A specific request would be met by a special search carried out directly by the user himself or delegated by him to an information specialist. A standing request to be kept regularly informed would be met by a continuing effort on the part of the information unit to retrieve information and see that it reaches the user periodically in the form of secondary (acquisition lists, bibliographic bulletins, etc.) or tertiary documents (syntheses, annual reviews and so forth).

Sometimes it is the user who approaches an information unit and asks it to solve a problem for him: this is called passive dissemination. But information units can, and indeed should, anticipate the user's needs either by offering him documentary products which they consider, after having analysed his needs, potentially helpful or by detecting his information problems and aiding him to solve them, if necessary through liaison services. This is active dissemination.

Dissemination comes up against a number of **problems and restrictions**: Those stemming from the variety of user needs, from their preferences for different channels of communication, from the ambiguity of their demands and grounds for satisfaction, and from their ignorance of information activities and of what information units can in fact do (see Chapter 20).

Financial restrictions, which oblige information units to cater for as many potential users as possible with limited resources. As a result they are forced to offer products and services of a standard type rather than ones that are more closely tuned to individual requirements, more detailed perhaps and presented in a more refined form, etc. Financial restrictions also make it necessary to charge for certain services or to limit them to certain users.

Institutional restrictions, related to the official status of the unit, to its position in a particular hierarchy, its location, its distance from certain information sources, and the fact that certain documents are covered by secrecy, thus ruling out certain services or reducing their scope.

Technical restrictions, such as delays in the receipt or processing of documents, the lack of essential equipment, insufficient staff, ignorance of certain alternative forms of dissemination, etc., all of which impair the quality and range of these services.

Restrictions arising from managerial shortcomings, such as insufficient contact between the unit and its user, the failure to make known its services, the priority accorded to processing functions, the concentration on 'traditional' services which may not be appropriate, and ignorance of the real needs of their users, etc.

There is nothing that the information units can do about some of these impediments, at least in the short term, but most of them can be overcome by energetic and intelligent management.

Dissemination of primary products

Dissemination can be organized in various ways: (a) on-site consultation in the information unit; (b) loans on the part of the information unit, i.e. the user is lent

the document temporarily; and (c) permanent acquisition by the user of the original text or a full size or reduced size copy (microforms), for which a charge is usually made.

On-site consultation takes two forms:

Controlled access: the user examines the catalogues of the information unit, fills in a request form with the bibliographic reference and call number of the document, hands it in to the desk or one of the unit's officers who then obtains, himself or through another person, the document in question from the stack. The document is lent to the user for consultation in the reading room but must be returned at the end of the day. This procedure needs more staff but permits supervision of all the operations. It is always employed for special collections such as particular groups, rare or precious books. Generally speaking, to avoid tying up the collection, each user can only borrow a limited number of documents of each type at a time;

Direct access: with this procedure, the user having utilized as necessary the catalogues to identify the documents he needs, himself obtains them from the shelves. To avoid shelving errors, he is usually asked not to replace them himself afterwards. This method gives the user more freedom and allows him to broaden his search, but it makes proper supervision more difficult and takes up more space. Handbooks and reference works are always available for consultation.

The loan service is a system whereby the information unit lends the user a number of documents which he can take home for a fixed period of time. Certain documents, however, are excluded: for instance, special collections, rare books, handbooks and reference works, and in general all documents in heavy demand. Each unit has its own rules for the number of documents of each type that can be borrowed by a user (there may be several categories of user) and for how long he is allowed to keep them. These rules take two factors into consideration: a user can only make proper use of a few documents at a time during the period in question and the unit must not allow documents that others might need to be unavailable for too long.

Loans are organized by a special service known as the loans service, and conditions and procedures are specified in detail. Loans have to be closely supervised: the unit must know who has the document and when it is due for return. This generally makes it necessary to maintain several different files: by document, by borrower and by remittance date. Loan operations are easy to computerize and the larger libraries are increasingly turning to computers for this purpose.

Interlibrary loan

This is a system under which a library that does not possess a particular document can borrow it from another library on behalf of one of its users, for on-site consultation or loan.

This system requires a specific agreement between the libraries taking part and standard procedures (forms, conditions of loan, control and dispatch of documents,

etc.), which are often settled at the national level. Union catalogues have to be established so that each participating unit can know what the other collections contain and where documents are to be found. This results in what amounts to a single collection which considerably extends the scope of user services and makes it possible to rationalize the acquisition of documents and share out the cost between the libraries taking part.

The circulation of periodicals is a special form of loan which is widely employed within organizations and follows a variety of different procedures.

The director of the unit or section concerned fixes these procedures in co-operation with the users, deciding on the type of circuit, the periodicals concerned, how many journals each reader is allowed and for how long, control formalities, etc., and then works out the circulation list.

Periodicals can flow from the information unit to each reader and back (star- or pearl-type circulation), or they can go from reader to reader (loop-type circulation), though it is more difficult to keep a check on the latter; lastly, these two methods can be combined for mixed circulation (see Fig. 23).

Whatever the method, the circulation of periodicals takes time and sometimes gets held up because a reader is absent or careless. Priority must be given to readers for whom the periodicals are particularly important and circulation must not take so long that most of the readers are deprived of recent information. These problems can be avoided by subscribing for several copies of essential periodicals, by circulating the list of periodicals received or a bulletin of the tables of contents and then providing only those periodicals or articles which are asked for (this is rather like an SDI service), by starting the circulation later, with newly arrived journals being first displayed for a week or several weeks in the unit, or by insisting on and enforcing a fairly short period of time for each reader. However it must be admitted that the circulation of periodicals is often by no means easy to administer. It calls for the same general instruments as loans, including a file of readers stating what journals they have been lent and a file of journals with the names of borrowers. The system does not lend itself to computerization, and computers are hardly worth while, since a single copy of a periodical cannot be circulated among more than about ten readers.

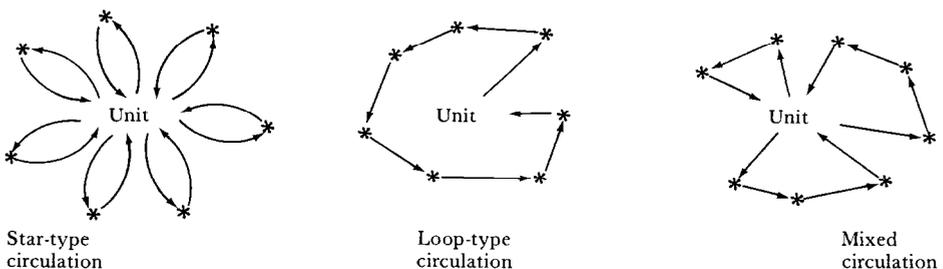


FIG. 23. The circulation of periodicals.

The provision of photocopies is a convenient means of disseminating primary documents without diminishing the library's collection, but it is only suitable for short documents and requires the necessary equipment. It is quite costly but the main limitation is the problem of copyright (see below). Some large units have a special department, known as the reproduction service, for the provision of photocopies.

The provision of microforms, and especially microfiches, is another increasingly common method of disseminating primary documents. Some publishers issue documents simultaneously in full size and microfiche versions and some documents (reports, reprints and American Ph.D. theses, for instance), are available only in microform. Their cost is less and postal charges are minimal since they can usually be mailed as ordinary letters, which also gets them to their destination more quickly and more reliably than in the case of parcels.

Many information units which store all or at least a large proportion of their collection (especially non-conventional literature) on microfiches are able to supply duplicates on request. The individual's use of microfiches is still limited by the fact that it requires the use of a special reader, but with the spread of these devices microfiches are being employed on an increasing scale for purposes of communication. As in the case of photocopies, however, the use of microfiches is restricted by the question of copyright.

Remote transmission of documents is a relatively recent technique which can only be employed under certain conditions and for certain documents. It utilizes two processes: telecopying of facsimile transmission via the telephone network, which is very quick and good for very long distances, and video transmission, which requires more complicated equipment and special cables but enables the user to receive the image of the document on a television screen. Both processes are still restricted to short documents, are very expensive and only worth while for urgent and particularly important communications. But there is no doubt that they will soon function on a much larger scale and that the cost will become competitive.

Copyright is a legal measure designed to ensure the material and moral protection of the author or beneficiary of any kind of work for a fixed period of time. It is permitted to reproduce a few copies for private non-commercial purposes (i.e. where no money changes hands), for teaching, research or study, without the payment of royalties or prior authorization. But if the document has to be reproduced for a group of people or for commercial purposes, it is necessary first to obtain the permission of the copyright holder, who may ask for royalties. If this is not done, the person responsible for illegal reproduction can be taken to law.

To be on the safe side, it is a good idea for units to require users ordering a reproduction to sign a statement committing them to respect the copyright. In certain countries, copyright has recently been extended to cover works transmitted orally, with the person transmitting the work considered as the author. Documents subject to copyright must mention the fact and state the year in which copyright begins preceded by the copyright initial ©.

Authors, of course, have a perfect right to be protected, but copyright can seriously reduce and handicap the general circulation of documents. Possible modifications are at present under study in several countries and at the international level.

Preprints and reprints are a form of communication in which authors send copies of their work directly. An author usually has a number of copies of this type at his disposal and distributes them among his colleagues to inform them of his work and obtain their opinion. Both individual users and information units can ask for a preprint as soon as they hear about a forthcoming document, often through indications such as 'to be published' or 'in preparation', etc., after the title. Similarly, once the document has been published it is customary for the publisher to give the author some copies of his work for his own use. It is often possible to obtain a copy of a 'reprint' free of charge by directly contacting the author (this is one of the reasons why secondary publications mention the organization to which the author is affiliated and even his full address).

News reviews are a form of selective dissemination of primary documents which is widely employed as a rapid and economical means of providing information on current events. Depending on the interests of a user or group of users—generally small and with specific needs—an information specialist chooses excerpts from newspaper articles or drafts brief summaries, which he then arranges by theme so as to build up a dossier for circulation as a bulletin or pinning on the notice-board. News reviews are brought out at close intervals (every day or every week) and may, in certain cases, be conserved either as series (by issue) or as dossiers (by theme). They are widely appreciated as an intermediary means of current information on subjects in the news.

Press cuttings represent another form of selective dissemination for periodicals. Articles dealing with a particular subject or series of subjects—usually fairly specific—are drawn from various periodicals and collected together. The resulting dossiers can be circulated like periodicals or used as a series. They have to be regularly and most carefully updated and their main advantage is that they offer a more detailed account of current events than news reviews. In certain cases, press cuttings can replace the analysis of periodicals when it is desired to constitute a file of articles.

Large lending libraries play a very important part in national and international systems. It is best to call them 'access libraries'. Some, like the Lending Division of the British Library or the specialized departments of a large information unit such as the CNRS Documentation Centre in France, are more or less independent. They possess complete collections of different types of document (monographs, periodicals, reports, etc.) and are able to provide documents on request for on-site consultation or loan, though it is more common for them to supply full-size or microform photocopies. This service is particularly useful for documents that are seldom utilized in a country or in a particular subject field (peripheral periodicals, for example), for rare documents difficult to obtain, or for non-conventional literature, which do not have to be acquired as long as they can be signalled by the

secondary services. The user generally has to pay the cost of reproduction and postage.

Translation services are vital to the dissemination of primary documents whenever a large proportion of the documents of interest to a group of users—even if the group is small—are produced in languages they cannot read.

Certain scientific periodicals published in languages not easily understood, such as Russian and Japanese, are systematically translated into English 'from cover to cover' and often appear at the same time as the original version. This allows the user to subscribe to the version easiest for him to read.

However, an information unit must be able to provide translations if a user requests them. These are usually obtained by turning to professional translators, who therefore have to be listed. Some large units have their own translation service which may also work for external customers (for example, the CNRS in France) and sometimes the unit's parent organization has a special department for this purpose.

There are various ways of dealing with this problem: sometimes the whole of the original document is translated and sometimes only certain parts of it, either because the user, lacking a sufficient command of the original language, wants to check certain points or because he is only interested in certain passages; in such cases, he indicates what he wants after reading the original or a translated abstract. The translation may be supplied in writing or orally (especially for partial translations); oral translations, provided by interpreters, bring the user into direct contact with the translator. Oral or partial translations are often closer to what is actually needed and are quicker and less expensive.

Before ordering a translation, care must be taken to make sure that this has not already been done, especially when the full text is required. This may be checked with the European Translation Centre at Delft in the Netherlands, which acts as a clearing house for many translations, particularly from the Slavic languages. It publishes the *World Index of Scientific Translations and List of Translations Notified to ETC*. Unesco publishes an annual directory of translations, the *Index Translationum*.

It is a useful practice for information units to conserve the translations they have made themselves or commissioned from elsewhere, to keep a register of them and to notify the clearing houses so as to avoid duplicated efforts.

Clearing houses perform a number of complex functions of both a primary and secondary nature. They may exist as independent units or as a special department within an information unit. Their purpose is to provide a single point of access to documents originating from a number of different places. The producers of these documents inform the clearing houses and usually send them a copy. The latter then circulate a description of the documents (bibliographies, indexes) and see that they are available by making copies (normal size or microform), by getting in touch with the relevant organization or by addressing the user to the producer if it does not possess a copy itself. They thus act as the centre of a certain type of network.

Clearing houses are in fact very similar to documentation services and can

perform a wide variety of functions. In international systems, they often help to provide access to non-conventional documents and, at the national level, to bring together documents produced by the various branches of public administration and decentralized bodies.

Dissemination of secondary information

Dissemination can take very different forms, depending on the content, presentation, periodicity and objectives.

Referral services do not provide the user with the documents or information actually needed for his query but refer him to the sources such as secondary publications, information units, professional organizations, research institutes and individual specialists, etc., and tell him where to find them. They utilize directories and files on sources, if necessary specially created for the purpose. They can function on their own or in co-operation with other services. It is difficult for them to gauge their effectiveness unless they keep in close touch with their sources and users, a task that is easier when they serve a small geographical area. When they exceed a certain size, they have to be organized as a separate section of the information unit, since the need to keep the files on sources up to date become rather time-consuming.

Current-awareness services are designed to keep users abreast of information that has recently been received or identified by the information units, particularly in the unit's subject field. For this purpose, they issue products at variable intervals—every week, every two weeks, every month or, in some cases, once a year. They anticipate specific needs by drawing the attention of users to new developments and/or enabling them to follow what is happening in their field. They play a vital role in updating the technical, scientific and managerial know-how of their clientele.

Lists of acquisitions are brought out by information units at regular intervals (every month, for instance) and show what documents have been acquired since the previous issue. They generally mention the title and author of the document—and sometimes its bibliographic reference—and arrange their information in alphabetical order, by type of document or according to a few major subject categories. They can be posted on the notice-board or distributed systematically or on request, in which case an application form for a loan is sometimes included (either at the end of the list or integrated with it, that is to say, the user is asked to tick the references wanted in the space provided and return the list). They can only reach a relatively limited number of readers and the latter will only make effective use of them if they are not too long.

Bulletins of tables of contents are periodical issues which reproduce, generally by photocopy, the contents pages of periodicals that have been selected or received during the period in question, arranged in alphabetical order of titles. They are sometimes accompanied by indexes of the periodicals, the subjects covered

and authors, but such indexes add greatly to the work of producing these bulletins.

Bulletins of this type help users to track down titles of particular interest to them from a considerable number of journals that they would probably not have the time to leaf through or which they cannot obtain. Bulletins of contents tables (current contents) based on major scientific and technical journals throughout the world are published regularly by the Institute of Scientific Information in Philadelphia.

Some of them also incorporate a form for requesting the loan of a document or a photocopy. They constitute a means of dissemination that is quick to produce and easy to consult.

Bibliographic bulletins appear regularly, in most cases every month, and are based on the bibliographic descriptions of documents received by the information unit since the last issue. They may be descriptive, (with only the bibliographic reference of the document and possibly an enriched title or succinct abstract), or analytical, (with an informative abstract). The majority of them contain abstracts and they are in fact often referred to as 'abstract bulletins'. Indeed, abstracts are essential for giving the user a clear idea of the documents and helping him to select what he needs to examine from the mass of available material. The references are usually organized systematically (classification scheme, subject categories, or index of a classification).

Bulletins containing a great many references relating to different subjects or disciplines are usually divided into parts which are published separately by specialist field. Examples of this approach are the *Bulletin signalétique* of the CNRS, the *Referativny zurnal* and *Excerpta medica*.

Though not obligatory, each issue of the bulletin includes an index by authors, possibly one by subject, patent numbers, report numbers or organizations etc., and sometimes a continuity index. In some cases, most of the indexes are published in a special bulletin every three months, six months or year.

The main purpose of bibliographic bulletins is to draw the attention of users to new publications, and their material is re-arranged every six months, every year or every few years in order to facilitate retrospective searches. It is becoming increasingly common for them to be produced by large systems or international networks which take responsibility for keeping track of world literature in their particular field. The production of abstract bulletins is, in fact, the central dissemination activity of certain information units.

With the aid of computers, the descriptions of documents can be recorded on magnetic carriers, periodic bulletins issued and the data base updated. The computer is used to prepare the bibliographic list and the indexes, and then each part can be reproduced by a photographic reduction process with transfer to an offset master, even by photocomposition.

Indexes are lists of terms, arranged alphabetically or in some other sequence (word, concept, formula, number, etc.), which describe the documents. To facilitate retrieval each term is accompanied by the reference or identification number of the document it describes. A document will therefore be cited as many

times as there are terms describing it. The index itself is a concordance table which links a list of terms functioning as search keys (and reflecting the centres of interest of users) to a collection of documents.

These keys, or entries, can be: the author (author index); concepts (subject index); the title (title index); place names (geographical index); sources (institution index); citations (citation index); or indexes of patent numbers, report numbers, dates, chemical formulae, and document numbers (continuity index, which links a document to others in the same series or to preceding documents on the same subject or from the same source).

Though usually included in the abstract bulletins, indexes are sometimes published separately. The problem here is that the user cannot immediately look up the abstracts of the documents he has selected without several separated operations.

One method of producing indexes is the Key Word in Context (KWIC) system, which consists of a computer program capable of permuting all the significant words of a sentence containing a limited number of characters, that is, the phrases that makes up the titles of documents. All the concepts contained in the titles are listed alphabetically down the centre of the page and followed by the words that come after them in the titles; if there is not enough room for this, the phrase concerned is continued on the left, before the key entry (see Appendix).

The advantage of this system is that it is quick and economical, but it takes up a lot of space and is very time-consuming for complex searches. The Key Word out of Context (KWOC) system is somewhat similar: here the significant words of the sentences are extracted, simply arranged in columns and followed by the numbers, titles or references of the corresponding documents. Access is therefore more direct (see Appendix).

Citation indexes give, for each original document, the list of other primary documents in which it has been cited. All the documents on a given subject can therefore be found in a single series. At the same time, this type of index provides information on the sources (one can see at a glance everyone who has worked on a subject) and relative importance of the document (reflected to a certain extent in the number of citations).

Selective dissemination of information

Selective dissemination of information (SDI) is a procedure for supplying each user or group users with the references of documents relating to their centres of interest selected from among the descriptions of all the documents received during the period in question. This avoids the user having to read right through an abstract bulletin—which can be very lengthy—or to choose the documents likely to be of interest to him. Although this method can be highly convenient from his point of view, it does not sift out documents of marginal interest or ones whose value lies

in the association of ideas, as can happen when he looks through an abstract bulletin or index. The effectiveness of an SDI service depends on the quality of the abstracts and the relevance of the 'user profile'.

The user profile consists of a set of keywords, organized as rigorously as the system permits, which describe the subjects of interest to the user. These keywords are compared with the keywords appearing in the descriptions of documents and a document is selected when the two coincide. The corresponding abstracts are then sent to the user, usually accompanied by a control-and-follow-up form on which the user can indicate whether the document really interests him, whether he wants a copy or has one already, or why it is of no interest to him.

The task of designing a profile is a complex operation calling for skilled information specialists and the co-operation of users. It is generally worked out in several stages and the result has to be regularly checked and updated.

If not too many users are involved, an SDI service can be based on manual operations, but the rapid expansion of this system is due mainly to the spread of machine-readable bibliographic data bases. In this case, the user pays a subscription according to the number of bibliographic data bases employed and the number of keywords in the profile. The references retrieved are sent to him each time the bibliographic data base is increased by a further issue (weekly, every two weeks or monthly).

SDI services can be aimed at a single user (individual profile) or at a group of users with the same interests (group profile). The group profile is clearly less expensive. Some information units have succeeded in defining several dozen group profiles along these lines and cover the essential information needs of all their users. At present, the SDI system is the best current awareness service available.

The purpose of **retrospective search services** is to provide users with the references of documents relating to a specific query, in most cases a single one. Unlike the services described above, they serve not to keep the user abreast of developments but to find the solution to a particular problem. The problem of course can vary greatly, from answering a simple practical question to compiling a list of all previous research on a subject.

Reference services have the task of helping the user to define his query correctly, particularly bearing in mind how he intends to utilize the information, since this can affect the choice of source. The information officer can either inform him what catalogues, directories, files, secondary publications or data bases to consult or seek out the relevant references himself, explaining if necessary how the user should go about his search (direct search) or doing it for him (delegated search).

The search itself can be based on instruments readily available in the unit, such as the card files of the library or the collections of secondary documents, or on external instruments, some of which cannot be employed at once. This is particularly true of computerized data bases which are not accessible on-line. In this case the query is recorded on a special form, then transcribed on a machine-readable carrier for processing on the next run (the same day or on certain days of the week),

after which the answer can be given. In on-line search services, a fairly recent development, the information unit has a terminal connected to the data base or to a network and the search can be effected at once. This method is also suitable for current awareness as the data bases are quickly brought up to date. The computer provides a list of bibliographic references, possibly with abstracts if the sources used include them, or at least the identification numbers of the documents or their references in secondary publications.

Dissemination of information is an unsatisfactory term for all the services set up not so much to supply primary documents, their references or their sources as to offer the directly usable or raw information they contain, or at least to rework this information or present it in a more convenient form for user.

Question-answer services are a first step in this direction. By designing the form that a user has to fill in for his query or by direct contact (dialogue, telephone or correspondence), they seek to clarify exactly what information the user needs and the most suitable form of presentation. They then search for this information with the various means at their disposal, in the unit itself or elsewhere (they might even ask for an evaluation of the retrieved information). Once they have gathered together all the material, they present it in the form desired by the user (this may involve the extraction of data and the evaluation or synthesis of various pieces of information). Unfortunately, this process is long and complicated and requires staff who are competent in the fields concerned.

In as much as some queries can be foreseen or have already been dealt with, the question-answer service can keep reasonably detailed information sheets or dossiers for providing at least part of the answer quickly. This work is sometimes enough to justify the existence of a specialized information unit.

Data banks, in the strict sense, maintain highly organized files containing not the references of documents—though these can be supplied if necessary—but the extremely precise factual information that has been extracted from them. This allows them to provide specific data for immediate use. Certain medical data banks, for example, can be consulted during an operation as to why a particular surgical problem has arisen and what should be done.

Analysis of information consists in describing the information contained in documents dealing with a specific field. The description has to respect a varying number of criteria that reflect the likely queries or points of view (purpose) of user. For example, it would not state simply that a given document is on irrigation, but would specify the system of irrigation, the conditions of use, the crops concerned and various parameters such as cost, consumption of water, evaporation etc. This makes it possible to retrieve the documents relating to a particular situation, but only for a strictly defined subject field for which a fixed list of criteria can be established. Whereas a data bank supplies isolated data, an information-analysis service indicates documents with different categories of data, if necessary within a given range.

Either activity can constitute the full-time occupation of an information unit or simply one of the services provided by a multi-functional unit.

Consolidation of information consists in checking the validity or defining the limitations of the information contained in the various documents and in confronting what is stated on a specific subject with other sources so as to arrive at cumulative and evaluated information. The outcome is generally recorded in a special file and disseminated in a tertiary document. In most cases, consolidation calls for investigation into all the primary information that has been collected.

Evaluation of information is a somewhat less demanding operation than consolidation though the dividing line between the two is by no means clear. Information, a single item or a series of items, on a specific subject is submitted for critical appraisal to one or more specialists who determine its value, in general or for a particular purpose.

An easy way of providing a user with evaluated information is to put him in direct touch with a specialist whose normal activities are focused on the subject in question, who is a regular client of the current-awareness service and who can if necessary be given the results of a retrospective search on the subject. An information unit can put this exploitation of specialist knowledge on a systematic basis by maintaining a special register of the fields of subject specialists, keeping in regular contact with them and utilizing the current-awareness services.

Repackaging of information: here the aim is to gather together information obtained in different forms from different sources and to present it in another form—sometimes on other carriers—to facilitate the work of users. For example, an assortment of references, abstracts and citations, tables and a synthesis paper could be presented orally or tape-recorded, as an audio-visual display, a film, posters, a popular guide, and so forth.

This operation is time-consuming, rather expensive and only economically worth while if there is no other way of passing on the information, if it costs less than an equivalent result obtained by the user himself, or if the end-products can be used often enough or by enough people. One could, for example, devote several days to summarizing a thousand-page synthesis report or master plan as a half-hour audio-visual display, using slides and a recorded commentary in order to produce a readily understandable synoptic review of the question.

Tertiary documents

Tertiary documents set forth the results of these operations (information assembled from a variety of sources, analysis evaluation, consolidation, data extraction, etc.) in a formal presentation. Some owe their existence to a specific query (synthesis reports, reviews, progress reports, state-of-the-art reports) while others are issued on a regular basis, in many cases once a year (annual reviews, 'advances in . . .', etc.).

They have two distinct advantages: they greatly condense available material on the subject in question and at the same time provide information of high quality.

Liaison services serve essentially as an active go-between for information services and users. Subject specialists call for information services and users. Subject specialists call on users, pin-point their information problems and either put them in touch with the appropriate information services or deal with these services on the user's behalf. Liaison work is an excellent means of stimulating the flow of information from unit to user and vice versa, since liaison officers are able to recognize useful documents and new sources of information or expertise. Those appointed to this work need a sound knowledge of the subject field and competence in information science.

Flash information (or express information) supplies highly condensed written or oral summaries of a few important current developments, either to keep the user abreast of what is happening in his field or in response to more or less regular requests. Though they could make direct use of document titles or abstracts—this would amount to a normal current awareness service—most services of this kind find it necessary to evaluate, select, condense and repackage the information concerned.

Dissemination through direct contact is all too often neglected by information units while users, who appreciate this opportunity to discuss, evaluate and select, clearly prefer this approach and utilize it time and again in their individual search for information.

It can take the form of an interview between the user and a specialist or organization working on his subject, of individual or group visits to organizations or the sources of production, information meetings or seminars.

The outcome of such meetings can be recorded (as written minutes or on tape) to help answer other subsequent queries of a similar nature. In fact, all dissemination operations concerned with specific queries should be handled in this way.

This kind of work is also an excellent means of promoting information activities and encouraging the flow of information. Moreover, it can often make up, at least in part, for a shortage of documentary resources.

The mass media (daily newspapers, magazines, radio and television) are another important means of promoting information services and of disseminating scientific and technical information, especially in countries where a large proportion of the population has no access to information units (because of distance, illiteracy or language problems).

Feedback from users is an integral and fundamental part of any dissemination service. Information units must make sustained efforts to obtain the maximum amount of data from users on the effectiveness of their services—that is, on the degree to which their content and presentation satisfy the needs of users—in order to facilitate general administration and make any necessary improvements. Feedback can be obtained by organizing the services in such a way that users have to enter into contact with the unit after having benefited from a service: by sending them forms so that they can request further services or give their opinion of the service rendered. These forms can be included in the products or distributed

systematically as part of an occasional survey, or quite simply handed over in the course of personal contact with the user, which units can and must foster.

The principal question is not only whether or not a satisfactory service is being provided (if there are no alternative sources, the answer is always likely to be yes), but whether it is in fact effective, in other words, whether it actually contributes to improving the performance of the user (for example, documents of higher quality resulting in more citations or reviews, increased productivity or profit, time saved, etc.).

Check questionnaire

- What is the importance of dissemination in the documentary chain?
 How can primary documents be disseminated?
 What is copyright? How does it restrict the dissemination of documents?
 What is the selective dissemination of information?
 What is a data bank?
 List the bodies which disseminate tertiary documents.
 What is 'repackaging of information'?

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Informations recherchées (1)

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(1) Please be **very precise**. If necessary, attach additional sheet(s) and/or explanatory document(s).
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18 International information programmes and systems

International co-operation

International co-operation is a natural consequence of information activities which cannot be divorced from other aspects of this field.

Throughout history, the transmission of information has always involved a great deal of international exchange through the meeting of scientists and the circulation of documents. Today, such exchanges have become even more important because: (a) scientific and technological activities are developing rapidly throughout the world; (b) a growing number of countries are contributing to these activities; and (c) science and technology are having an increasingly important and direct impact on all aspects of social and economic life.

International co-operation takes a great variety of forms, including direct contacts between individuals and organizations, international meetings, the communication of as yet unpublished documents and information, the circulation of published documents, the exchange of regular publications, international programmes for research and data collection, international information systems, technical co-operation for setting up or improving information systems, and so forth.

The framework of co-operation also varies widely. In some cases, individuals and organizations establish and maintain informal contacts, while in others a formal agreement or programme is drawn up, occasionally involving the creation of a special organization, which may in turn expand until it eventually acquires an independent status. It is becoming increasingly common for governments to step in and arrange co-operation through bilateral or multilateral conventions either of a general nature (for example, conventions for scientific and technical co-operation, measures according preferential customs treatment for documents) or more especially concerned with the exchange of information (agreements for

co-operation in scientific and technical information, the creation of international information systems, etc.).

Technical co-operation with developing countries is exemplified by the short- or long-term assignment of skilled personnel to help design or implement programmes, the supply of documents and equipment, assistance with staff training either locally or abroad (awards of scholarships for regular courses, special training courses, study tours) and help with methodology. This kind of co-operation may be focused on the national system as well as on individual systems and may provide assistance at all levels: planning, implementation, evaluation, system enhancement, staff training, user education, promotion, etc. It is now playing an increasingly important role in most developing countries.

In the field of information, the objectives of international co-operation are:
To provide a more satisfactory response to the needs of users throughout the world.
To make the fullest possible use of mankind's accumulated stock of knowledge in order to speed up progress.

To improve the productivity of existing information systems by attracting more users.

To ensure, by task sharing, that individual systems are not brought to a halt by the increasing quantity of data to be processed and the costs involved.

To faster the gradual harmonization and integration of information systems with a view to attaining the foregoing objectives.

To see that all countries have information systems in keeping with their needs. It is important to distinguish carefully between international activities and programmes in the field of information on the one hand, and international information systems on the other. The fact that the purpose of certain programmes is to set up a system has often caused a certain amount of confusion on this point. International activities and programmes are relatively co-ordinated actions, decided upon by international organizations or the representatives of a number of countries, which usually fall within the framework of their normal activities and are intended to improve the circulation and exploitation of information. International information systems, on the other hand, handle the actual processing of information by means of a coherent methodology and are therefore able to supply data.

For example, the UNISIST programme covers a series of activities aimed at facilitating the interconnection of scientific and technical information systems but does not itself supply references on scientific subjects. The AGRIS system, on the other hand, assembles bibliographic data and constitutes files by means of which documents can be identified.

As the sheer amount and complexity of international activity in this area makes a complete panorama impossible, the following account will simply examine its main aspects and offer some significant examples.

Activities of the United Nations agencies

These organizations play an important role in the field of information. In the first place their routine operation, with meetings of their constituent bodies, working groups, specialized committees, seminars, in-service training, study tours, consultations, studies and publications, can in itself be regarded as an important mechanism for the international transfer of information.

Their information activities in the strict sense are conducted at a number of levels: internal information systems, the encouragement of international co-operative systems, the promotion of international information systems and of information systems for developing countries. Most of these organizations, which number about thirty in all, have their own information units. There are many different types, ranging from the traditional library to computerized digital data banks, and the fact that they handle documents produced by their organization or received from elsewhere gives them an international field of action. These units work mainly for the officials of their respective organizations but also for those of other organizations and for the delegations of member states and consequently for a great many countries. Some of them allow research workers and specialized bodies to use their services. Moreover, many of their products and services are open to all users free of charge or, more often, for a fee. Since we cannot describe all these internal information systems, we shall illustrate their diversity and considerable resources—often not fully employed because insufficiently known—by examining the most important ones.

The United Nations itself, in New York, has a large library with a computerized bibliographic information system and a documentation system, the latter for the Organization's own documents. In addition, it is developing specialized services in economic and social questions, marine resources, natural resources and human settlements.

The United Nations Office in Geneva has a large library and systems specialized in social development in Europe and in narcotics.

The Economic and Social Commission for Asia and the Pacific (ESCAP), located in Bangkok, has an information centre and clearing-house for demographic questions connected with its region and is developing specialized systems for agriculture, sea transport and trade.

The Economic Commission for Latin America (ECLA), based in Santiago, Chile, has an economic and social documentation centre which is also engaged in setting up a regional network.

The Economic Commission for Africa (ECA), in Addis Ababa, has an information system on development in Africa and a very rich library on the economy of countries in the region.

The United Nations Disaster Relief Co-ordinator Office (UNDRO), in Geneva, is building up a library and data bank on relief operations.

The United Nations Industrial Development Organization (UNIDO), in Vienna, has an industrial information section providing a number of services.

A library and documentation unit collects and processes both internal and external documents on industrial activities, answers the queries of users and runs an SDI service for UNIDO officials. The industrial-information system indexes and abstracts UNIDO documents with the aid of the *Thesaurus of Industrial Development* and produces *Industrial Development Abstracts* by computer. The publication unit issues a monthly information newsletter and *Guides to Information Sources* for various branches of industry. The industrial information service, with the help of its many correspondents in various countries, runs a question-answer service on industrial problems for developing countries; it also maintains an international directory of consultants and provides a referral service on information sources regarding industrial machinery and equipment. An industrial and technical information bank has recently come into operation as a pilot project for the iron-and-steel industry, the fertilizer industry, and the agricultural industries and machinery sectors; it utilizes UNIDO's own and other information resources to collect and analyse technological information on behalf of institutions concerned with industrial development in developing countries.

The United Nations Environment Programme (UNEP), in Nairobi, has a library and data bank on the main environmental variables and an international register of potentially toxic chemical products.

The United Nations Development Programme (UNDP), in New York, has organized an international referral service concerning the agencies and programmes of developing countries that could engage in technical co-operation with other developing countries.

The United Nations Institute for Training and Research (UNITAR), in New York, has a library on international relations, economic and social development and other research fields of the Institute. In liaison with other United Nations institutions, it organizes seminars on international documentation and on the documentation of international organizations.

The International Labour Organisation (ILO), in Geneva, has information services on special education and employment for the blind, on the co-operative movement, safety at work, social problems and employment, vocational training, special training for the handicapped, labour legislation, and employment for women. Its central library and documentation branch has developed and utilizes an integrated computerized system (ISIS) for managing its library operations and producing a monthly bibliographic bulletin and index of the ILO library's acquisitions and main publications. This data base, also obtainable on magnetic tape, is used for retrospective searches and an SDI service, both of which are available on request. The ISIS processing system has been adopted by many national and international systems and organizations. It is at present maintained by Unesco, which also arranges training courses in its use.

The United Nations Food and Agriculture Organization (FAO), in Rome, has information systems on rural structures, crop reactions to fertilizers, plant genetics, agricultural statistics, food contamination, rural populations, paper-

and-pulp resources, forestry resources, water sciences and fishing, fish catches, and the contamination of aquatic organisms. The FAO Library and Documentation Systems Division maintains a large library, with a computerized file of periodicals received, and a computerized documentation centre which produces bibliographic bulletins and indexes for information retrieval in printed form or on magnetic tape.

The United Nations Educational, Scientific and Cultural Organization (Unesco), in Paris, has a library, a computerized documentation system for Unesco documents and those of its affiliated institutions, a documentation system for the human and social sciences, a referral system for data relating to the marine environment and an information system on education managed by the International Bureau of Education (IBE) in Geneva.

The World Health Organization (WHO), in Geneva, has a library and information systems on: (a) appropriate technology in the field of health; (b) research on filariasis and other parasitic diseases; (c) the counter-indications of medicines; and (d) a directory of African medical research institutions.

The International Civil Aviation Organization (ICAO), in Montreal, possesses data banks on airport facilities, air-transport statistics, means of communication and navigation, and suppliers of equipment.

The International Telecommunication Union (ITU), in Geneva, has directories and data banks on transmitting stations, international radio standards, radio broadcasting frequencies, coastal stations, ship radio stations, broadcasting legislation, telephone and telegraph services, and international telegraph stations.

The International Atomic Energy Agency (IAEA), in Vienna, has a library and information systems on data concerning neutrons, nuclear reactions, and can deal with requests for the measurement and evaluation of nuclear data.

The General Agreement on Tariffs and Trade (GATT), in Geneva, has a library and data bank on the customs duties and international trade of eighteen developed countries.

Certain institutions of the United Nations system have, in addition, set up on their own initiative or been given the responsibility of setting up international information systems and then helping to run them by acting as both input centres and co-ordination centres. Most of these systems are based on the participation of national and regional centres which collect the information produced in their respective countries, process it in accordance with standard procedures and send the descriptions to an international centre for merging into a single data base; they are then made available to participants in various forms for exploitation on behalf of users; for example:

The United Nations is developing an information system on population (POPINS). FAO co-ordinates three international systems: AGRIS (international current bibliography on agricultural sciences and techniques), to which eighty input centres now contribute, CARIS (data on programmes, projects and agricultural research institutions and workers in developing countries) for which eighty-five

centres gather data by means of questionnaires, and AGLINET (network of agricultural libraries) with at present seventeen major libraries from the various regions of the world taking part.

The IAEA co-ordinates an international nuclear information system (INIS), which has served as a model for many of these systems: forty-nine national and regional centres and thirteen organizations are currently members of INIS which, apart from a current bibliographic data base usable in the form of bulletins or magnetic tapes, provides for central access on microfiches to signalled non-conventional documents.

The World Intellectual Property Organization (WIPO), in Geneva, has set up a world patent information system (INPADOC) in which forty-nine national and regional centres currently participate. It produces an indexed bibliographic data base, available as bulletins or on magnetic tape. WIPO also runs retrospective search, SDI and question-answer services.

The World Meteorological Organization (WMO), in Geneva, has set up a world-wide decentralized system for collecting and processing meteorological data, known as the World Meteorological Watch, whereby a network of weather stations, data-processing centres and telecommunication centres enables any country to gain real-time access to meteorological data and to process other data off-line.

UNEP has organized an international referral system (IRS) for information sources relating to the environment in which seventy-one national and regional centres at present participate.

The UNIDO question-answer service, mentioned above, is another example of a fully decentralized international system.

Unesco has established, in association with the FID, an international directory on research in documentation (ISORID) in which seventy-four national centres take part. It co-ordinates an information system on the application of science and technology to development (SPINETS), now at the pilot-project stage. Within the framework of its General Information Programme, Unesco helped to set up and provides support for an international register of serial publications (ISDS) now with fifty-eight participating centres, an international information centre for terminology (INFOTERM), in Vienna, an international centre for bibliographic descriptions (UNIBID), in London, a clearing-house for documentary languages (IINTE), in Warsaw, a world referral centre for scientific data (CODATA), in Paris, and an international referral centre for information-handling equipment (IRCIHE), in Zagreb.

As for the promotion of information systems, the Inter-Organization Board for Information Systems (and Related Activities) (IOB), in Geneva, apart from its interagency directory for technical co-operation projects (CORE), seeks to foster co-operation and harmonization between the systems of the different agencies.

Unesco has designed and is currently executing a General Information Programme whose purpose is to provide a conceptual framework for the development of information systems, and more particularly to promote information policies and

programmes at the national and international levels, the adoption of uniform standards and methods for information systems, the development of information infrastructures and specialized information systems, the training of information specialists and users.

The programmes of certain organizations also include assistance to Member States, in particular developing countries, to enable them to join international information systems and to organize and improve their information units working in each organization's field of competence. This is in particular true of Unesco, FAO, UNIDO, IAEA, WHO, WIPO and UNCTAD (the United Nations Conference on Trade and Development).

These activities can be financed by the organization's own budget but a large proportion of the cost is sometimes borne by the United Nations Development Programme (UNDP) and national bodies. In the former case, the actions have a more limited scope (consultations, training courses, scholarships, equipment, assistance with methods), while in the latter they can cover the establishment, spread over several years, of a fully fledged information system or a training institution for information specialists, not to mention more specific operations.

Lastly, the organizations of the United Nations system have organized and continue to organize a large number of world and regional conferences, meetings and seminars on the problems of information, which not only enable ideas and information to be exchanged but foster the harmonization of activities and the preparation or supervision of joint action.

Activities of regional organizations

In the field of information, the activities of the regional organizations are essentially similar to those of organizations in the United Nations system. They include the same three aspects: internal systems, the establishment and promotion of international systems, and the promotion of information systems and technical co-operation in member states.

However, the fact that the participating countries are more homogeneous and geographically closer to one another puts some of these regional organizations in a better position to foster co-ordination and the introduction of common systems. In certain cases, genuine regional information systems are gradually being set up.

The Organisation for Economic Co-operation and Development (OECD)

has for many years brought together the representatives of member countries within an Information Policy Group, which has held consultations and carried out studies on the responsibility of governments, the functions of national focal points, the description of existing facilities in member countries, the possibility of multilateral co-operation in the field of information, the future of scientific and technical information, and the criteria on which governmental decisions should be based. This work has as an important catalyst. The OECD was the

moving spirit behind a semi-centralized international documentation system, the International Road Research Documentation (IRRD), which has fifteen member countries and three working languages, English, French and German.

The Council for Mutual Economic Assistance (CMEA) has established an International Centre of Scientific and Technical Information in Moscow, of which nine socialist countries are members. Its aim is to encourage integrated information systems linking the member countries, to promote research and development in the field of information, to provide scientific, methodological and organizational assistance for the information units of member countries and to help with the training of information specialists.

The member countries of the **European Communities** co-operate through a committee on scientific and technical information and documentation. Their activities are centred on the establishment of EURONET, a European computerized network for data transmission which will interconnect Europe's existing data bases with on-line access. For this purpose, the Communities have drawn up a plan of action, setting up numerous working groups to examine information needs and resources in various important sectors, the ideal qualities of future networks together with their legal, financial and technical aspects, the technological and methodological problems associated with the development of integrated systems (multilingualism, standards, software), and the training of specialists. Many commissioned studies, meetings and training sessions have been devoted to these topics. A special division of the Commission of the European Communities is responsible for co-ordination and acts as an international processing centre for certain specialized networks such as the System for Metallurgy Information and Documentation (SDIM), the European participation in AGRIS (EUR-AGRIS), and the European Nuclear Documentation System (ENDS).

The European Space Agency (ESA) has built up a Space Documentation Service (SDS) at Frascati in Italy, which is noteworthy for being a decentralized system exploiting data bases produced by other organizations. It employs the RECON system to enable user units to search in real time the various data bases to which the SDS subscribe. The service has gradually been opened to organizations in Western Europe outside the Agency. It has a link-up with the National Documentation Centre of Morocco, in Rabat.

The Commonwealth Secretariat, in its co-operation programmes and especially those relating to science and education, also gives an important place to the use and dissemination of information. One of its most original contributions has been the information system of the Commonwealth Agricultural Bureau (CAB), which consists of a network of centres, specialized in different aspects of agriculture, which collect and analyse carefully selected world literature in their respective fields and publish bibliographic and abstract bulletins which are now also available in machine-readable form.

The Agency for Cultural and Technical Co-operation (ACCT), of which

French-speaking states from all over the world are members, pays special attention to scientific and technical information in its programmes, especially in its programme of scientific co-operation. It publishes technical handbooks, specialized glossaries, bibliographies and nomenclatures for various fields and assists international information systems, in particular by translating into French and disseminating the operation manuals of AGRIS, Level 1, of the CARIS pilot project and of the DEVSIS study; it contributes to the development of national information systems by supporting training institutions for specialists, awarding scholarships and organizing training sessions for specialists and users. It is also helping to set up networks between research institutions, in particular for the processing of data on soils, and to popularize science by providing technical personnel for youth camps.

The Organization of American States (OAS) is implementing two programmes in the field of information. In 1973, the Department of Scientific Affairs of the OAS Secretariat launched a Technical Information and Assistance to Industry programme with the aim of creating the means to enable small- and medium-sized enterprises in Latin America to make use of existing technical know-how in their production activities. Through its Department of Cultural Affairs and Department of Education, the OAS is engaged on a development programme for libraries, archives and documentation systems. This programme is designed to improve these services and integrate them into national and regional systems, to strengthen and modernize school and university libraries and integrate them into the national and regional information systems, and to develop archives services at the regional level. A special effort is being made to train specialists by supporting an Inter-American School of Librarianship at Medellín in Colombia and an Inter-American Centre for the training of archivists at Córdoba in Argentina. It assists the national training institutions, organizes introductory courses (particularly at the postgraduate level) and short programmes of specialist training; it awards numerous scholarships, arranges seminars, study tours, etc., and contributes to the development of information units and systems. The programme also pays considerable attention to standardization and the development of uniform instruments to facilitate the gradual integration of national systems into a regional network, particularly where bibliographic description is concerned. A number of manuals and studies have been produced for this purpose. In co-operation with the United States Library of Congress and several institutions in the member countries, it has developed a Spanish-language communication format for bibliographic data (MARCAL) and its operation manual. Work is also proceeding on a computerized network with on-line access for the compilation of bibliographic data (AMIGOS) in co-operation with several other bodies and information units with large holdings of documents on Latin America.

The Pan-American Health Organization joined forces with the Government of Brazil, in 1967, to set up a regional medical library (BIREME), on which a Brazilian network for medical information and a regional network now covering

Argentina, Chile, Peru, Uruguay and Venezuela are based. The function of this library is to encourage the exchange of duplicate publications, maintain an extensive reference collection, supply photocopies of locally unobtainable documents, carry out retrospective searches, run an SDI service, organize a programme of specialist publications, train specialists in medical information, contribute to the standardization of information activities and disseminate WHO publications. In 1974, BIREME became one of MEDLINE's regional centres and on-line tests of this system have already been made within Brazil. The member countries of the Andrés Bello Convention (Bolivia, Chile, Colombia, Ecuador, Peru and Venezuela) also consult each other regularly and organize studies and training sessions with a view to co-ordinating their information activities.

In Africa, the regional organizations concerned with the development of the Senegal and Niger rivers have both set up computerized documentation centres which collect and analyse documents produced in their member countries, issue bibliographies and indexes, conserve the documents on microfiches and provide a service for users. The East African Academy, now the Kenya National Academy for the Advancement of Arts and Sciences, has been co-operating with the Foundation for International Development (DSE) on the organization of a Regional Co-ordination Centre for Information Training (CRIT) which undertakes studies of manpower and training problems and runs short courses focused on the various aspects of information work. Its programme is drawn up by a regional committee of specialist representatives from East African countries. The East African organizations concerned with agricultural and veterinary research have created an **East African Literature Service** which provides an alert service for countries in the subregion by publishing bulletins of tables of contents and arranging SDI and photocopy services. Regional training institutions have been founded at Dakar, Senegal (for French-speaking librarians, archivists and documentalists), at Kampala, Uganda (for English-speaking librarians) and at Legon, Ghana (for English-speaking archivists).

The Arab Educational, Cultural and Scientific Organization (ALECSO) makes an effort to promote and co-ordinate information activities in member countries through the programme of its Documentation and Information Department. It regularly holds seminars on various aspects of information. ALECSO gathers information on questions relevant to its field of competence from the member countries and issues current publications, directories of information sources, and reference works (statistical bulletins and bibliographic bulletins) and, in addition, runs training programmes. Another aspect of its work is the development of standardized instruments for Arabic, such as an ISBD manual, an Arabic version of the Dewey Classification, a classification for Islamic disciplines, a list of subject headings in Arabic, and so forth.

The Industrial Development Centre for Arab States (IDCAS) has set up a computerized documentation centre for processing documents concerning

industry produced in the Arab countries or of potential interest to them, which also offers services for referral, references, information retrieval, translation and publishing, etc. IDCAS has launched a programme for the development of an industrial information network in Arab countries which calls for standard instruments (in particular, the translation and adaptation of thesauri), short training courses for personnel and a basic education programme; user education and the promotion of services; the development of centres, specialized in various branches of industry and located in different countries, which will be able to process information in greater depth and to maintain closer links with the enterprises concerned.

Countries in Asia have also improved their co-operation over the last few years. Studies have been undertaken to prepare the way for a regional network of scientific and technical information and regional courses have been organized for the training of information specialists. An Agricultural Information Bank (AIBA) enables nine countries to participate as a group in the AGRIS system. A network of agencies specializing in technological information and industrial extension work (Technonet Asia) links eleven institutions from nine countries to a co-ordination centre in Singapore and enables them to pool their experience, information resources and expertise, and to train personnel, provide services for industry and strengthen the centres of excellence.

Activities of national agencies

These bodies play an important part in the efforts to facilitate co-operation and promote information systems in developing countries.

Though governmental technical co-operation agencies seldom have specific programmes in the field of information, they contribute greatly to the development of information systems, either directly or within the framework of projects with broader objectives. In many cases, much of their assistance is in the form of documents, but their principal activity in this connection is probably their contribution to the training of information specialists by organizing local courses, and above all by awarding scholarships to enable students to be trained in specialized institutions and acquire practical experience in the information units of their respective countries. They also assign specialists and consultants, set up information units, provide equipment and even provide for the buildings to house these units. Most developed countries, and certain developing countries too now, frequently undertake action of this kind.

The International Development Research Centre (IDRC) in Canada differs slightly from these agencies in structure but also in that it has a specific programmed managed by its Division of Information Sciences and tends to concentrate its activities on strengthening and modernizing existing regional and

- national resources. It is also engaged in the construction of an international information system for questions related to economic and social development (DEVSI) (see Appendix 8, p. 277), which is expected to lead to an international bibliographic data base with decentralized input. Preliminary studies have been completed and work is now focused on the development of local centres.
- In certain developed countries, especially the United States, there exist non-profit-making private organizations, such as foundations, whose programmes include activities relating to international co-operation and the problems of information. Their contribution, however, is often within the context of their support for other activities such as higher education, the development of agriculture and public health. The Asia Foundation, the Carnegie Corporation, the Ford Foundation, the W. K. Kellogg Foundation, the Rockefeller Foundation and the Franklin Book Program undertake activities that are fairly similar to those of governmental co-operation agencies. Though their resources are admittedly more limited, the fact that their procedures tend to be more flexible enables them, in certain situations, to play a decisive role in developing information units and training institutions for information specialists, in building up collections, and in book production and the training of personnel.
- A number of information units, run and financed in a purely national context, nevertheless cover such a large proportion of world literature in their fields that their collections acquire international standing. In the United States, for example, Chemical Abstracts Services and MEDLARS cover the most important world literature in chemistry and medicine respectively and, in France, PASCAL covers a large proportion of world literature in many disciplines. This naturally leads them to sign international agreements, either directly with information units or through government departments, for other countries to use their services and even, in some cases, contribute to input.
- Most countries in fact possess national information services whose content and presentation are of great interest to other countries and which are following a similar path. The agreements they conclude sometimes contain preferential clauses in favour of or especially adapted for developing countries, and even a special service for their needs (c.g. an ad hoc selection of the data base).
- The national agencies practise some other interesting approaches to international co-operation: association agreements, for example, which can be either based on general mutual interests or centred on the implementation of specific joint programmes, enable the partners from developing countries to utilize the information resources of other members of the association. They have also organized networks to provide a question-answer service (VITA in the United States, for example) in which highly qualified volunteer specialists use their knowledge and the data bases available to them to give very detailed answers to queries from developing countries.
- Some information units in developed countries wishing to set up an international network or working in an international field also become involved in developing

similar information units in the Third World, financed through direct contracts, their own resources or the co-operation agencies of their respective countries. Their data bases and services, furthermore, are often a precious source of information for developing countries. While on this subject, mention should also be made of the major lending libraries such as that of the British Library in the United Kingdom or CNRS in France, which are often very quick at supplying copies, or more often photocopies or microfiches, of locally unobtainable documents. Furthermore, the rapid development of computer and telecommunication networks permitting the interconnection of national data bases with access in real-time offers interesting prospects for developing countries wanting to exploit the huge stocks of references throughout the world. At present only those countries not too distant from the regions with these networks (Mexico and Morocco, for instance) make regular use of them, but this approach is undoubtedly going to take on more and more importance in the years to come.

Activities of international non-governmental organizations

These bodies also contribute greatly to international co-operation, the exchange of information and the promotion of information systems.

Most scientific disciplines have international associations usually formed of national associations and individuals or institutional affiliates. Through their regular congresses, publications, working groups and the personal contacts so fostered, these associations are essential to the international circulation of information. Many of them have working groups and programmes specifically concerned with the transfer of knowledge and the promotion of information systems.

A large number of these associations are members of the **International Council of Scientific Unions (ICSU)**, whose aim is to promote international scientific activity. It represents eighteen international unions from scientific disciplines such as astronomy, geophysics, chemistry, physics, biology, mathematics, geography, nutrition, etc., sixty-four national members (academies of science, national research councils, national associations of scientists), twelve scientific associates and two national associates. ICSU organizes co-operative research projects, a case in point being the International Geophysical Year. It sets up committees or commissions to deal with areas of interdisciplinary research or general problems such as science teaching, data, or science and technology in developing countries. It co-operated with Unesco on a feasibility study for a worldwide system of scientific information which gave rise to the UNISIST Programme. In 1975, ICSU established a study group to look into scientific information policies. Two of its organs are concerned exclusively with information activities.

One, the Abstracting Board (ICSU-AB), was created to promote the circulation of information by providing ICSU members with a framework for co-ordination and harmonization and joint action in favour of the standardization, rationalization and development of their activities. The ICSU-AB operates through working groups or joint committees with other organizations with the same concerns and studies, for example, the standardization of input procedures, multilingual thesauri, etc. This work has been published and has led to the establishment of international standards. The ICSU-AB is represented on the specialized working groups of Unesco's General Information Programme.

The ICSU international Committee on Data for Science and Technology, known as CODATA, performs a similar function in regard to numerical data. On the technical side it appoints working groups to study problems such as the accessibility and dissemination of data, fundamental constants, the internationalization and standardization of thermodynamic data, the presentation of biological data in primary literature, etc. With the assistance of Unesco, CODATA has set up a world referral centre for sources of data.

International associations with similar structures and activities to those of the scientific associations are to be found in various technological sectors and in many branches of economics. But it should not be forgotten that international trade fairs and exhibitions are also vital to the flow of information in these sectors.

The programmes of **The World Association of Industrial and Technological Research Organizations** and **The World Federation of Engineering Organizations** also deal with problems of information. The WFEO has organized several international conferences and is engaged on a number of studies in this field, in particular through its committees on the information of engineers.

Among these organizations, **The Society for International Development** is distinguished by the fact that it provides a question-answer service on the macro-economic problems of socio-economic development for developing countries with the aid of a decentralized network of correspondents.

Another institution which should be mentioned in this context, though it is more fully discussed in Chapter 19, is the International Organization for Standardization (ISO).

There also exist a number of international non-governmental organizations chiefly or exclusively concerned with information:

The International Council on Reprography (ICR) serves to promote this technique and harmonize related activities and operations.

The International Federation for Information Processing (IFIP) works to promote data-processing and the development of research, international co-operation, the exchange of information and specialist training. It has working groups on programming, education, computer applications in the health sciences, technology, data communication, information systems and on the relations between computerization and society, etc. It also has a relatively

independent special interest group, the IAG, which is concerned with computer applications in public and private administration.

The International Federation of Library Associations and Institutions

(IFLA) seeks to foster international understanding, co-operation, discussion, research and development in all the fields of activity of libraries, including bibliography, information services and staff training, and to represent the interests of librarianship at the international level. It has opened a regional office for Asia and plans to open one in all the other regions. Its secretariat is based at The Hague in the Netherlands. IFLA, with support from other quarters, has established in London an International Office for Universal Bibliographic Control responsible for promoting this important project inspired by IFLA and maintaining the ISBD, and an international lending office within the Lending Division of the British Library at Boston Spa (United Kingdom). It has recently launched a three-year programme for the development of libraries and the training of librarians in the Third World, whose purpose is to provide a framework for financing, from external resources, projects submitted by members from these countries. It publishes the work of its sections and two journals.

The International Federation for Documentation (FID) serves to promote all aspects of documentation, including practical activities, research and training. Its General Secretariat is at The Hague, in the Netherlands, but it has two Regional Commissions, one for Latin America and one for Asia and Oceania, which are relatively independent centres. The FID, through its various technical committees, encourages research in classification and terminology, education and training, industrial information, linguistics in documentation, patents documentation, and research on the theoretical basis of information and the problems of developing countries. A central committee on classification manages the Universal Decimal Classification, an important FID contribution. The FID publishes the work of its committees, its conference proceedings and two journals.

The International Council on Archives (ICA) was created to foster the development of archives and international co-operation in this field, in particular by serving as a meeting ground for all archivists and for organizations concerned with archives. ICA members are grouped into regions: Latin America (ALA); the Arab countries (ARBICA); the Caribbean region (CARBICA); Central and East Africa (ECARBICA); West Africa (WARBICA); South-East Asia (SARBICA); and South and West Asia (SWARBICA). Besides the separate activities of these regional branches, the ICA works through a number of specialized sections and committees and publishes *Archivum*, a specialized international journal.

IFLA, FID and ICA have established a liaison committee to co-ordinate their action and they co-operate on a regular basis with Unesco's General Information Programme.

International information systems

In this domain the situation is highly complex. Some of these systems cover almost all the world's information in their field but are administered and financed by a national agency; some are decentralized networks in which each member unit sticks to its own methods and participates on a voluntary basis, with co-ordination by the general consensus of members; others are decentralized or mixed networks, also with voluntary participation, but employing a common methodology; and there is a last group, which, besides a common methodology and a mixed structure, were created by intergovernmental bodies: here the term 'international systems' takes on its full meaning.

From another point of view, although the systems with which we have so far been most concerned are chiefly engaged in handling bibliographic references with or without abstracts (i.e. secondary systems), the range of complementary functions (for example, access to primary documents, referral, retrospective searches, SDI, etc.) varies considerably from one system to another. Indeed, certain systems are centred on other functions such as referral, question-answer services or information analysis.

International information systems, a recent development originating in the mid-1960s, are now expanding quickly and benefiting from rapid technological advances. They will probably continue to increase in number, extend their scope, diversify their functions and engage in more and more interactions, in particular through computer teleprocessing networks, and will gradually form a more coherent and integrated pattern.

An international information system owes its creation to the political determination of the governments concerned or of the top management of one or more existing national systems. Once the idea is accepted by enough prime movers, the next step is for an international team to undertake a feasibility study on the basis of which a decision to set up the system can be taken by all potential partners or at least by the main ones. After this, the system has to be designed in detail, with particular attention to the methods and instruments to be employed. This phase completed, the system is installed and, after a period of experimental testing (generally limited to certain functions or participants), it then goes through the successive phases of normal operation, revision and expansion.

All these systems share the same purpose: to provide more comprehensive, rapid, practical and economical access to world information in their respective fields. Success depends on standardizing and rationalizing their products and procedures so that tasks can be shared out efficiently. Each participant can then concentrate its resources on a particular function or on a particular portion of the information and obtain the rest from its partners in directly usable form. Generally speaking, the systems are based on decentralization of input and output functions and centralization of the functions relating to data base creation and system maintenance. In other words, each member country is responsible for collecting primary documents, with the work usually shared out according to their origin

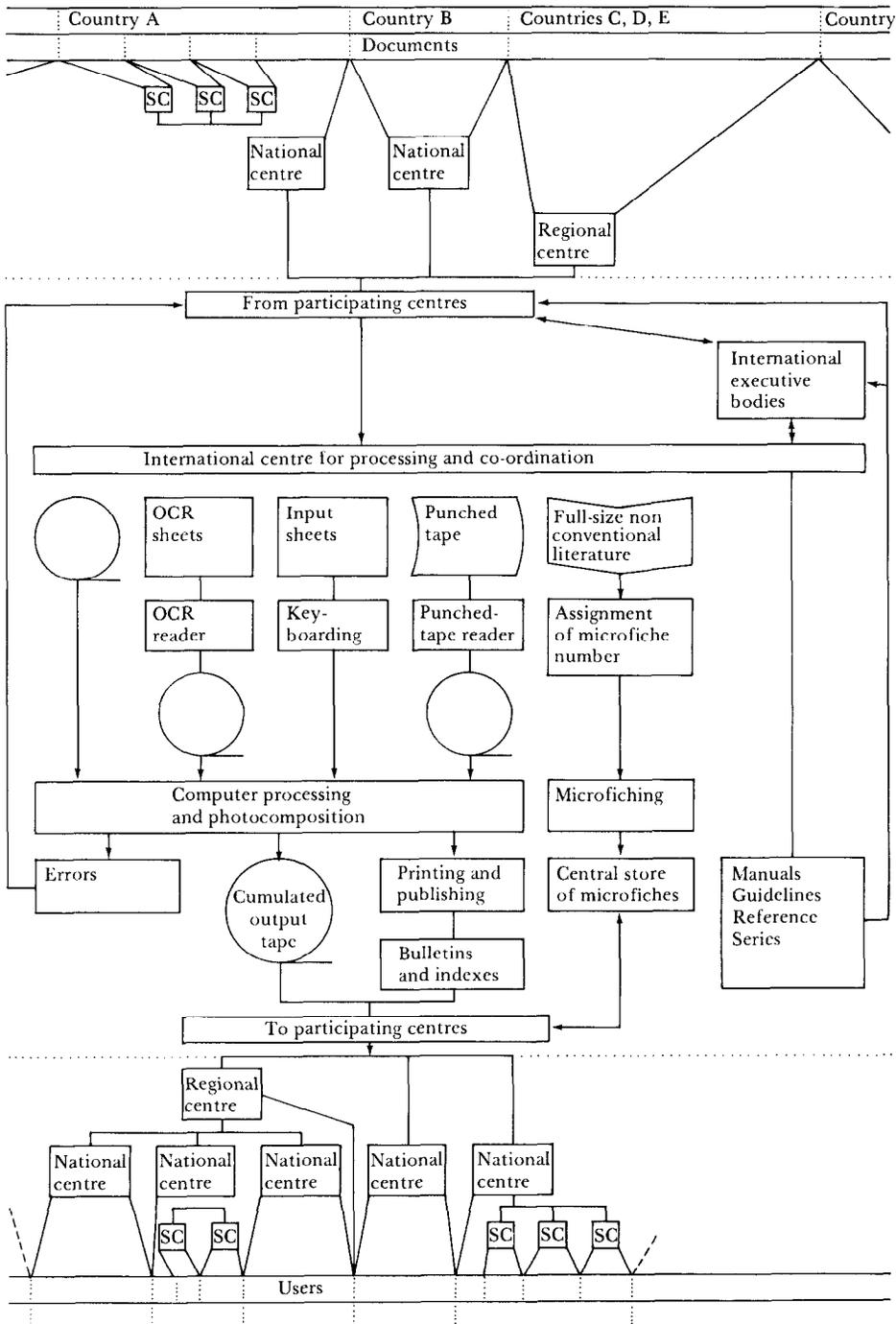


FIG. 24. Theoretical and simplified flowchart of an international information system.

(i.e. each country dealing with the literature produced on its territory), and subsequently for access and bibliographic and contents description in conformity with common rules and formats. The countries can, if they wish, establish a regional centre for this purpose or designate an existing centre. An international centre is then set up to verify the data supplied by the participating centres, to merge them into a single data base and to create the instruments required for exploitation (bulletins, magnetic tapes), which are distributed to the participants. User services are mostly organized at the national level, though certain operations may also be carried out at the international centre.

The system is managed by a body with representatives of all participating countries, assisted if necessary by technical committees or consultative groups with a possibly broader membership (e.g. including representatives from related systems, professional associations, etc.) or a membership based on professional qualifications rather than national representativity alone. The international centre, in co-operation with the participants, co-ordinates the activities, maintains the instruments employed (thesauri, formats, rules for description, authority lists, etc.) and is responsible for developing the system and training the personnel required.

The participants share the cost of central operations on a pro rata basis in proportion to their resources but each finances the input and output units of their respective countries. The group as a whole, however, can provide assistance for the installation and maintenance of the system.

As things stand, these systems, most of which are centred on documentary functions, are not yet capable of providing universal access to information. They give references but access to the primary documents concerned is still causing problems, and certain other functions, such as selection, evaluation, repackaging and appropriate dissemination, are still not sufficiently developed. This said, by reducing the amount of literature processed by members to what is produced in their respective countries, while maintaining, in exchange for no more than their own contributions, each participant's access to all the information available in the system as a whole, these systems represent a considerable advance. Their advantages easily outweigh the constraints of using a standardized methodology and advanced techniques, which are increasingly within the individual or collective scope of all countries.

Check questionnaire

- What is the difference between an information programme and an information system?
- What are the advantages of joining an international information system?
- Do there exist international question-answer services?
- Is remote and on-line use of an international information system possible?

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Appendix 1. Unesco's General Information Programme (PGI)

The General Information Programme was established in November 1976 by the General Conference of Unesco at its nineteenth session held in Nairobi.

The purpose of the PGI is to develop a conceptual framework for the information systems set up by the various organizations of the United Nations system and in particular for all the information activities of Unesco.

It covers three types of activity: (a) conceptual activities (studies, general policy, etc.); (b) standardization (guidelines, manuals, etc.); and (c) operational activities (training courses, assistance to Member States for the development of information infrastructures).

The PGI is more particularly concerned with four sub-objectives as means to attain a general objective laid down in Unesco's Medium-Term Plan for 1977-82, namely, the development and promotion of information systems and services at the national, regional and international levels. The first sub-objective—promotion of the formulation of information policies and plans—is designed to achieve a higher level of awareness of the value of information as a national and international resource, to improve co-operation between Member States within the PGI framework, to improve the quality of planning of these organizations and the functioning of national information infrastructures, and to achieve a better understanding of the information transfer process, with a view to harmonizing information policies and reducing impediments to the exchange of information.

The second sub-objective concerns the promotion, establishment and use of methods, rules and standards in the field of information. It is chiefly intended to improve international standards, particularly in regard to bibliographic descriptions (by means of Universal Bibliographic Control), and the presentation of publications, with a view to facilitating the interconnection and compatibility of information systems and contributing to the definition of a conceptual framework for information transfer.

The third sub-objective concerns the development of information infrastructures, at both the national and regional levels, in order to contribute to the socio-economic growth of Member States and to facilitate the transfer of information. This objective calls for the establishment and dissemination of guidelines, the organizing of consultations and meetings, the preparation of pilot projects, advice on setting up or improving technical services, and technical assistance for Member States. This group of activities comprises the major part of the operational activities covered by the PGI and includes projects of varying importance financed by Unesco, the United Nations Development Programme (UNDP) and other sources.

The fourth sub-objective concerns the theoretical and practical education and training of specialists in and users of information. The specialists in question include documentalists, librarians and archivists. The aim is to draw up a policy and long-term plans for training in this field, to organize courses, in particular for teachers entrusted with the training of specialists and for the managers of information systems, to harmonize and co-ordinate education and training programmes and related activities and to promote theoretical instruction and practical training in Member States.

As it now stands the PGI provides a single framework for implementing Unesco's fundamental programmes in the field of information, which were previously attached to the science sector and the culture and communication sector. The first of these is the UNISIST Programme, adopted by an intergovernmental conference in 1971, whose innovative action,

backed up by periodical evaluations, the redefinition of objectives and further innovations, is intended to catalyse and organize international co-operation in interconnecting and developing information systems for the physical, natural and social sciences. Its objectives are to improve the technical means of interconnection, to increase the capacity of information units and systems, to develop human resources and an institutional framework conducive to the expansion of the systems, and to co-operate with developing countries and assist them in strengthening their information infrastructures. Another initiative was the NATIS concept, launched by an intergovernmental conference in 1974, which aims at the integrated development of national information infrastructures—particularly libraries, archives and documentation centres—with a view to establishing national information systems capable of meeting all the economic and social development needs of Member States. The General Information Programme was entrusted for execution to a special Division of the Unesco Secretariat placed under the authority of the Assistant Director-General for Studies and Programming.

An Intergovernmental Council composed of the representatives of thirty Member States is responsible for the general design and planning of the programme, for recommending priorities, examining the results obtained and encouraging and co-ordinating the contributions of participating Member States.

An Advisory Committee assists Unesco in determining world needs and trends in the field of information and in assessing how far the PGI and its results measure up to these needs and trends.

In 1979, Sixty-three Member States had national Focal Points and/or National Committees for UNISIST, these being the main channels through which Member States participate in PGI activities.

Both the Intergovernmental Council and the Unesco Secretariat are empowered to set up ad hoc committees and working groups to study particular aspects of the programme. There are, for example, an Ad Hoc Committee on Education and Training Policy and Programme and Working Groups on the exchange of bibliographic data, information analysis centres and the technology of system intercommunication.

The PGI programme and budget are submitted by the Director-General of Unesco to the biennial General Conference for any necessary amendments and final approval. The PGI publishes a quarterly information bulletin, the Unesco *Journal of Information Science, Librarianship and Archives Administration*, The proceedings of its committees, conferences and seminars and numerous reports, studies and guidelines.

Further information on the PGI may be obtained by writing to: The Division of the General Information Programme, Unesco, 7 place de Fontenoy, 75700 Paris, France.

Appendix 2. SPINES

SPINES (Science and Technology Policies Information Exchange System), an international system for the exchange of information in the application of science and technology for development, is in the process of experimental development by Unesco.

The objective of SPINES is to compensate for present weaknesses in the exchange of selected data on the application of science and technology for development. Unesco, operating within the conceptual framework provided by the UNISIST Programme, is making

efforts to establish on an experimental basis a simple and effective mechanism for the collection, analysis and dissemination among its Member States of documents and factual data directly related to policy formulation, management, transfer and evaluation in regard to science and technology. SPINES was inspired by the overall structure of the INIS system developed by the IAEA and, in its present proposed form, will be a co-operative, decentralized and computerized system for the storage and retrieval of bibliographic data accompanied by indexing terms and abstracts. At a later stage, it is planned to handle factual data too. SPINES is expected to comprise a central processing unit and several national or regional relay units to enable volunteer countries and organizations to participate in the SPINES input and to provide services for users.

The period from 1971 to 1976 was given over to preparations: a feasibility study worked out the system's technical, legal, financial and managerial requirements; the list of SPINES periodicals was prepared and published; and the basic SPINES Thesaurus, which contains 10,500 terms, two-thirds of which are authorized descriptors interlinked by a network of 74,000 relations, was produced in English.

For 1977-82 a Pilot Programme has been established: (a) to co-ordinate adaptation of the SPINES Thesaurus into Arabic, French, Portuguese, Spanish and Russian; (b) to conduct field trials with a view to promoting the system, producing sample products and testing various operational procedures appropriate to the needs and resources of users; and (c) to assist interested countries in establishing their national information services for science and technology policy.

SPINES will cover all information of direct concern to policy formulation, management, evaluation and transfer in the field of science and technology, and in particular the foundations of science and technology policies (theories, standards and methods), science and technology resources (manpower, financial and institutional resources, information services and equipment for R&D), the practical implementation of science-and-technology policy (the planning, programming, financing, forecasting, evaluation and transfer of science and technology, and the management of R&D), and the general societal content and results of plans, programmes and projects focused on related scientific and technological activities.

The potential users of the system are (a) the decision-makers, managers and administrators responsible for science and technology in governments, parliaments, universities, research institutions, enterprises and international organizations with scientific interests, and (b) research workers in science policy.

Documentary sources will include books, periodical articles, legislative documents and regulations, reports, theses, machine-readable and audio-visual documents, etc., and factual data sources will include numerical, nominal and perceptual data, statistics and indicators, etc.

The output of the central processing unit is expected to take the form of a computer-produced bibliographic bulletin and index, *Science Policy Index and Abstracts (SPINIA)*, and magnetic tapes (for bibliographic data, indexing terms and abstracts), prototypes of which were planned for dissemination in 1980. On the basis of these magnetic tapes, all types of computer retrieval services (SDI, current information, retrospective search) will be provided by the national and regional centres.

Depending on the results of ongoing studies and experiments it will be decided, probably in 1982 or 1983, whether or not to make SPINES fully operational.

Further information on SPINES may be obtained by writing to: The Division of Science and Technology Policies, Unesco, 7 place de Fontenoy, 75700 Paris, France.

Appendix 3. ISDS

The International Serials Data System (ISDS) was introduced as part of the UNISIST Programme in the early 1970s. Its objectives are to establish and maintain an international register of serial publications that will incorporate all the data needed for identification, to develop and promote the use of a standardized code (ISSN) for the precise identification of each serial publication, to facilitate retrieval of the scientific and technical information contained in periodical publications, to make these data available to all countries, organizations and individual users, to establish a communication network between libraries, secondary information services, the publishers of serial publications and the international organizations, to promote international standards for bibliographic descriptions, communication formats and the exchange of information relating to serial publications.

The ISDS system operates through an International Centre located in Paris and national and regional centres designated by interested governments. So far, centres have been established in forty-five countries.

It is managed by an Executive Board elected by a General Assembly of representatives of Member States. The International Centre is assisted by a Consultative Technical Committee.

The International Centre is responsible for creating and maintaining the international data base and the standard instruments employed (communication format, character set and rules for bibliographic description, abbreviation and transliteration, etc.), for publishing the directory and providing information services based upon it, for maintaining the ISO list of abbreviated periodical titles, for helping to establish national and regional centres, for allocating them series of ISSNs, for registering serial publications in the absence of a corresponding national or regional centre, and for helping to train the staff of the participating centres.

The task of the national and regional centres is to assign an ISSN to each serial publication produced in their geographical area, to establish the corresponding records and send them to the international centre. They maintain a file of the serial publications they monitor and can also use the international directory to serve their users. Some of them publish lists and indexes based on their files.

The data base, which initially contained some 25,000 records, now has about 50,000. These records indicate, for example, the date of registration, the code of the responsible centre, the ISSN, the date of first publication, country of publication, alphabet used in the original title, key title, other titles, publisher, etc.

The International Centre publishes a bimonthly bulletin with details of all additions and changes since the previous issue which, like the directory, is available in machine-readable form; there are plans for publication on microform. It also publishes, every six months, a supplement to the ISO list of abbreviated periodical titles.

To be assigned an ISSN, the publishers of serial publications apply to their national or regional centre or, if there is no such centre, to the International Centre. The data base can also be used to produce special lists and indexes.

Further information on the ISDS may be obtained by writing to: The International Centre for ISDS, 2 rue Bachaumont, 75002 Paris, France.

Appendix 4. ISBN

The International Standard Book Number (ISBN) is the international system for numbering books. Although some publishers began to number their books over a century ago, the need to assign each book a unique straightforward identification number usable for computer processing became a matter of urgency in the 1960s, when the largest publishing houses started to computerize management and distribution.

This book numbering system was first introduced in the United Kingdom in 1967, in the United States the following year, and subsequently in the German-speaking and French-speaking countries of Western Europe. It has now become an international system.

The ISBN contains ten digits, arranged in four parts separated by hyphens or spaces. The first part indicates the group to which the publisher belongs, the second the publisher, the third the individual book, and the final digit is a control number for automatically checking the correctness of the ISBN. The larger the production, the fewer the digits used for the group and publisher numbers, the point being to leave the maximum number of digits for the books themselves (six digits cover a million ISBNs, i.e. a million titles).

Co-ordination is in the hands of an international agency in West Berlin, whose function is to promote and direct the system with the help of an international advisory committee, to prepare manuals and instructions, to give advice and supervise application of the system, to recognize and allocate identification numbers to the group agencies and to register these numbers.

Group agencies are established by publishers, publishers' associations and bibliographic centres on a national, regional, linguistic or other basis. For example, there exist British and American agencies, an agency for the publishers of books in German from the Federal Republic of Germany, Austria and German-speaking Switzerland, another for books in French from France, Belgium and French-speaking Switzerland, and one for international organizations. Each agency is responsible for administering its group, giving technical advice to its members and ensuring that the standards are respected; it receives applications from publishers who, according to the criteria laid down by the group agency and approved by the international agency, are eligible for membership of the group and allocates them a number which is entered in its register.

The publishers apply the system by allocating a book number and control number to each title, by keeping a register of these numbers, by printing the number in each book and by mentioning it in their catalogues, advertisements and order forms, etc.

Further information on the ISBN may be obtained by writing to: The International Agency for ISBN, Staatbibliothek Preussischer Kulturbesitz, Potsdamerstrasse 33, D-1000 Berlin 30.

Appendix 5. INIS

The International Nuclear Information System (INIS) was set up by the International Atomic Energy Agency, whose statutes give it the task, among other things, of facilitating the exchange of scientific and technical information on the peaceful use of atomic energy.

The preparatory work was carried out between 1966 and 1968. The system came into operation on a limited scale in April 1970 and reached its present stage of development in 1976.

Its purpose is to handle the documentary processing of world literature relating to all aspects of the peaceful use of atomic energy (physics, chemistry, materials, earth sciences, biology, agriculture, medicine, health, safety and the environment, the industrial applications of radio isotopes and radiation, engineering and reactor technology, legal and economic aspects, etc.) and to make this information available to organizations and specialists working in these fields in member countries of the Agency.

The literature published in their geographical areas is processed by forty-nine national centres and thirteen international organizations with the aid of a common methodology which is specified in seventeen reference documents (INIS Reference Series) that standardize the formats, carriers, rules for description and descriptors.

It is estimated that INIS now covers 95 per cent of world literature on the subject, including about 30 per cent of non-conventional documents (unpublished or not available in the commercial circuits). Each centre uses standard criteria to ensure the relevance of documents. The actual processing covers bibliographic description in conformity with a cataloguing manual, authority lists and common subject categories, indexing by means of a common thesaurus in four languages, and a free-text abstract in English and sometimes in another language. These data are gathered in keeping with standardized formats and are recorded on an input sheet, on an OCR worksheet (readable by an optical-character-recognition device) or on punched or magnetic tape.

The material is then sent to the IAEA International Processing Centre in Vienna, which checks that the records conform with the established standards and merges them into a single data base, which is then made available on magnetic tape or as a printed bulletin, *INIS Atomindex*, issued twice a month. Apart from bibliographic references and abstracts, this bulletin contains indexes by author, corporate author, subject, conference, report number, patent number, or standard number. Cumulative indexes are published twice a year.

The complete data base now contains over 300,000 references and a further 60,000 are added each year. The participating centres, moreover, send the international centre a copy of all the non-conventional documents, which are photocopied on microfiches and conserved in this form in a clearing-house for consultation users.

A number of exploitation systems enable the participating centres to use the INIS data base for providing retrospective search, SDI and on-line search services.

The working language of the system is English. Each participating country appoints a liaison officer who, with his fellow liaison officers and the directors of the International Centre, manages the system. The cost of the international centre's operations is borne by the IAEA and that of the decentralized units by the participating countries and organizations.

The international centre, in liaison with the participating centres, is responsible for the maintenance and development of the system. It also arranges training for their staff in the use of the system and provides technical assistance for its installation.

Further information on INIS may be obtained by writing to: INIS Section, International Atomic Energy Agency, P. O. Box 590, A-1011 Vienna, Austria.

Appendix 6. AGRIS, CARIS, AGLINET

The Food and Agriculture Organization of the United Nations (FAO) is continuously involved in improving the transfer of scientific and technological information, within FAO's

fields of competence and responsibility (agriculture, forestry, fisheries, nutrition, rural development, etc.), among its member nations. This is done through the development, promotion and implementation of an integrated set of information transfer programmes, which include the establishment of worldwide agricultural information systems and the execution of field projects for the strengthening of national capabilities in information and documentation.

FAO's Library and Documentation Systems Division (at FAO headquarters in Rome, Italy) is particularly involved in the following information systems and projects, considered as sectoral implementation of the UNISIST Programme:

The International Information System for the Agricultural Sciences and Technology (AGRIS), a co-operative worldwide information system on current agricultural literature.

The Current Agricultural Research Information System (CARIS), a co-operative information system on current agricultural research in developing countries.

The Agricultural Libraries Network (AGLINET), a co-operative system for the exchange of services and information among the main agricultural libraries.

Technical assistance field projects for the establishment and/or strengthening of national or regional agricultural documentation centres.

AGRIS

Agricultural literature is growing at an estimated rate of 250,000 new documents per year. More than 500 specialized information centres are producing—with considerable duplication, but also conspicuous gaps—an estimated 1.5 million abstracts per year.

The AGRIS Programme aims at improving the flow of information and services to users, through co-operative action involving all countries and their specialized documentation centres, in order to achieve a better coverage of the newly produced agricultural literature, avoiding gaps as well as duplication of efforts and increasing the variety and efficiency of services.

The AGRIS Current Awareness System pools bibliographic information—subject indexed—provided by more than eighty (as of 1977) national and regional participating centres. In operation since January 1975, this system was already producing more than 100,000 references per year in 1977 and the figure is expected to reach 200,000 per year in the next few years.

References cover not only monographic material (books and articles in periodicals) but also so-called 'non-conventional' literature (meetings and project reports, theses, surveys and studies, etc.) particularly relevant to agricultural development.

The references, together with author and subject indexes, are published monthly in AGRINDEX (of which a limited number of copies are made available free of charge to all FAO member states, but which is also available on subscription). AGRINDEX also exists in magnetic-tape form, obtainable free of charge by all participating countries. Several of the participants are already providing, from these tapes, SDI services for their national users. Cumulative yearly indexes to AGRINDEX are now available.

The documents cited in AGRINDEX can be obtained through commercial channels, national libraries, the participating input centres and/or the AGLINET system (see below).

The AGRIS Co-ordinating Centre, at FAO's headquarters, is responsible for methodology development, the training of staff in participating countries and the central processing of the data. AGRINDEX publishing is handled by APIMONDIA (Bucharest).

The AGRIS Programme also includes activities aimed at the creation of specialized information networks—through the study and promotion of co-operative agreements among specialized information centres—for the improvement of services to users (abstracts, syntheses, SDI, etc.) in specific subject fields such as forestry, tropical agriculture, etc. Among the objectives of this action are a co-ordinated approach to the preparation of abstracts, the production of abstracts in a greater number of languages, and an increased coverage of non-conventional literature.

CARIS

Agricultural research in developed countries is already well documented through national directories. This is not generally the case for agricultural research in developing countries, although such research is carried out in some 2,500 institutions, employing some 15,000 specialists, covering 5,000 programmes and some 30,000 projects.

The CARIS Programme aims at improving the collection and dissemination of information on agricultural research currently being carried out in developing countries, through a co-operative action involving all these countries and the setting up of a worldwide information bank and network of services to users.

A pilot project, covering fourteen countries of West Africa, was carried out in 1972. It produced (in English and French) directories containing information on 237 institutions and 1,555 projects.

A worldwide project was started in 1975, intended to cover all developing countries. By the end of 1976, ninety-two countries had indicated their intention to participate. As of July 1977, sixty countries and eight international research institutes had provided data covering 2,027 institutions, 9,913 specialists and 3,570 programmes listing some 20,000 projects.

This first group of data has been processed at FAO's headquarters to constitute an initial data base. Directories on institutions, research workers and programmes, including subject indexes, were published in 1978. The data will also be available in magnetic-tape form, together with the computer programmes for updating and use. Several countries have already published national directories using the data collected for CARIS.

From 1978 onwards, data processing and data-base updating were decentralized to regional and national CARIS Centres: for example for Latin America, Africa, the Arab countries and South-East Asia. The CARIS Co-ordinating Centre at FAO's headquarters handles methodology development and provides technical assistance, including training, to the regional/national centres. It also maintains the central data base and disseminates the data collected by countries and regions.

AGLINET

The primary aims of AGLINET are to promote mutual and national exploitation of agricultural library resources, for the benefit of the world's agricultural development, through systematic collaboration among agricultural libraries for the efficient provision of inter-library loan services (including photo-reproduction) and exchange of bibliographic information and data on the participating libraries holdings.

The basic convention on AGLINET was signed in 1974. The network consists of a chain of major agricultural libraries in each region or country of the world, supported by the

international centre, FAO's David Lubin Memorial Library, at FAO's headquarters. By 1977, seventeen libraries had joined the network.

Field projects

Besides the aid provided to countries, in methodology and training, by the AGRIS and CARIS programmes, technical assistance in agricultural documentation/information is also provided by FAO to developing countries or groups of countries through field projects aimed at the creation or strengthening of national/regional agricultural documentation centres.

This assistance takes the form of consultants' missions or of small-or large-scale projects including the provision of methodology, expert services, equipment and fellowships. They are financed by the United Nations Development Programme (UNDP), by bilateral aid agencies, or by foundations.

One of the objectives of such projects is to assist countries in tracing, assembling, processing and making available to users the agricultural documents produced in or on each country during the recent decades. Such important documents are essential for the country's development but are more than often dispersed in the country itself or abroad. Another objective is to create in each country a focal point capable of participating in international information systems such as AGRIS and CARIS and through them to be in a position to offer adequate documentation services to all their national users.

Further information

Additional information on AGRIS, CARIS, AGLINET and field projects (i.e. lists of participants, conditions of participation, services offered, documents available, etc.) can be obtained by writing to: The Food and Agriculture Organization of the United Nations, Library and Documentation Systems Division, Via delle Terme di Caracalla, 00100 Rome, Italy.

Appendix 7. IRS

The International Referral System of the United Nations Development Programme is designed to provide those needing information on environmental matters with a list of names and addresses together with details on the capabilities of suitable information sources. The data base of IRS is the *International Directory of Sources of Information on the Environment*, which is published annually and regularly updated with quarterly supplements and indexes.

IRS operations are decentralized over a global network with a national focal point in each participating country. The focal point collects information on sources within the country, forwards these to UNEP (Nairobi) for collation in the *International Directory*. In response to national queries, the focal point operates a full referral service using its own copy of the directory in printed, microfiche or computer-readable form.

The UNEP function within the network is overall co-ordination, publication of the directory and the provision of training, publicity materials, etc., together with the development of the system and the operation of a focal point for United Nations environment-related information systems.

The coverage of IRS is loosely stated as 'all information which could be of value in solving environmental problems'. As such it does not distinguish in any way between developed and developing countries. Both have information that needs to be made more accessible, within and outside each country; both have problems that can benefit from the improved awareness of global information resources provided by IRS.

The IRS directory was first published in January 1977. The July 1977 supplement brought the total number of sources to well over 4,000 from thirty-three countries, thirteen of which are developing countries. A further forty governments have designated IRS focal points and are currently setting up the administrative machinery needed to make IRS operational in their countries.

Further details about IRS can be obtained from national focal points or from: UNEP/IRS, Box 30552, Nairobi, Kenya.

Appendix 8. DEVSIS

In 1974, the International Development Research Centre (IDRC) in Canada launched a programme for the establishment of an international information system on development sciences (DEVSIS).

The Organisation for Economic Co-operation and Development (OECD), the United Nations Educational, Scientific and Cultural Organization (Unesco), the United Nations Development Programme (UNDP), the International Labour Office (ILO), and the United Nations Department of International Economic and Social Affairs joined this venture and formed with the IDRC, a project steering committee which co-opted eight persons representing the different regions of the world. In 1975, a study team of fifteen members, specialists in the design of international systems and specialist representatives of potential users, was set up to make preparations.

DEVSIS was modelled on other international systems such as INIS and AGRIS: that is to say, it was designed as a network of national and regional centres using a standard methodology to feed in information and providing services to users, together with an international centre responsible for constituting the common data base, maintaining the system and training staff for the participating centres. DEVSIS is regarded as a sectoral application of the UNISIST Programme, with which it maintains close links.

DEVSIS is intended to cover conventional literature and more particularly non-conventional literature on all aspects of economic and social development. It is expected to include two data bases, a bibliographic data base using the ISIS format and software and with in-depth subject indexes for the documents, and a referral data base containing the description of information and data sources on economic and social development.

The system would serve development specialists in national and international administration, research and educational institutions, and economic organizations.

It is planned to publish the bibliographic file twice monthly, as a Bulletin (DEVINDEX) or on magnetic tape, and the file of sources (DEVPROFILE) every three months. A centralized microfiching procedure for non-conventional documents and a network of regional repositories would facilitate access to the primary documents. The system would be managed by an intergovernmental executive committee of representatives from the participating states, assisted by a central technical committee of representatives from the participating centres and by an administrative and financial committee.

The study team plans to place the DEVSIS international centre under the wing of an already existing organization with similar concerns. While efforts to solve the institutional and financial problems connected with the establishment of such a system are being pursued, local pilot projects focused on the control and exploitation of bibliographic data are being carried out.

Further information on DEVSIS may be obtained by writing to: The Division of Information Sciences, International Development Research Centre, P. O. Box 8500, Ottawa, K1G 3H9 Canada.

Appendix 9. MEDLARS and MEDLINE

In 1889, the United States National Library of Medicine (NLM) began publication of *Index Medicus*, a bibliographic bulletin of world literature in the field of medicine. In 1964, a computerized system known as MEDLARS (Medical Literature Analysis and Retrieval System) was set up to produce and exploit this bulletin.

More than 2,200 selected periodicals from about sixty countries are analysed and indexed by means of a controlled vocabulary called MeSH (Medical Subject Headings), with an average of about thirteen keywords assigned to each article. Since 1963 a data base has been built up, which now contains over 2 million references.

The system produces the *Index Medicus* in printed or in machine-readable form and permits retrospective searches and SDI.

An on-line retrieval system, MEDLINE, came into operation in late 1971, with access via the TYMNET network.

This system gives rise to various forms of co-operation. Through exchange programmes with nearly 900 institutions in eighty-five countries, the NLM acquires publications. With the help of USAID, the American agency for technical co-operation, NLM services, such as interlibrary loan, retrospective search, MEDLINE search and the issue of bibliographic and index bulletins, are made available to certain developing countries mainly in Latin America, but also in Asia and Africa.

A special programme allows the use of United States Government funds earmarked for food-aid programmes in various developing countries to finance translations, bibliographic work and syntheses designed to improve the flow of information.

Bilateral agreements have been concluded with a number of countries—initially with the United Kingdom and Sweden, and then with the Federal Republic of Germany, France, Canada, Australia and Japan—for their participation in the MEDLARS system: the NLM supplies the magnetic tapes and software and trains the staff required so that the participating centres can exploit the system, to which they in turn contribute by coverage and input of their national literature. The indexing vocabulary MeSH has been translated into German, French and Japanese, and several of the network's centres are working on the development of this vocabulary. International use of MEDLINE has been organized in Scandinavia, Canada, France and the United Kingdom.

The NLM, in conjunction with other organizations, has been involved in setting up a MEDLARS regional centre for Latin America, located at the Regional Library of Medicine (BIREME) in São Paulo, Brazil, and sponsored by the Pan-American Health Organization. The centres associated with MEDLARS are consulted on questions of policy formulation programmes for the international development of the system.

Finally, NLM often gives advice on the development of biomedical information system in many countries.

Further information on MEDLARS and MEDLINE may be obtained by writing to: The Deputy Director, International Programmes, National Library of Medicine, Bethesda, MD 20014, United States of America.

Appendix 10. CAS

Since 1907, Chemical Abstracts Service (CAS), a division of the American Chemical Society, has been abstracting and indexing primary documents to publish *Chemical Abstracts (CA)*. *CA* consists of weekly printed issues containing abstracts and rapidly prepared indexes plus in-depth six-monthly volume indexes. Every five years (every ten years prior to 1957), the ten-volume indexes are merged and republished as collective indexes. *CA* provides complete coverage of the world's scientific and technical documents relevant to chemistry and chemical engineering, monitoring more than 14,000 periodicals from 150 nations and patent documents from 26 nations as well as reviews, technical reports, conference proceedings, symposia, dissertations, and books.

Each weekly issue of *Chemical Abstracts* contains, for each abstract, a bibliographic citation which provides complete reference information for the original document. This heading is followed by the next of the abstract. Included in each weekly issue is a set of indexes which are derived from the abstract content and pertain only to that issue. This set includes a keyword index, which lists significant words or phrases from the abstract or its title in a single alphabetical sequence along with the corresponding abstract number. The terminology employed in the abstract and the weekly indexes reflects that used by the author(s). Each issue also includes an author index, a numerical patent index organized by country, and a patent concordance which links original and subsequent equivalent patents to the original patent abstract.

Volume indexes for *CA* are published separately after each six-monthly volume of *CA* has been completed. While the volume numerical patent index and patent concordance are essentially a cumulation of the weekly indexes, the other volume indexes are prepared largely from an examination of the original documents. In preparing the volume indexes, staff derive and formulate the contents in a highly standardized nomenclature and terminology to assure grouping of related entries. Thus these indexes emphasize the terminology of the discipline of chemistry, and volume-index entries may include references to chemical substances and general subjects not included in the abstracts. The volume indexes include extensive, detailed chemical-substance and general-subject indexes, which as master indexes provide reference to abstracts in *CA*, which in turn identify the corresponding primary publication. Volume and collective indexes also include author, molecular-formula, and ring indexes which provide alternative routes of access to the information content of these indexes to simplify entry into the organized contents of the highly structured *CA* chemical-substance and subject indexes.

The abstracts in *CA* are classified in eighty subject groups or sections, each covering a specific area of chemistry or chemical engineering. Representative sections include: Agrochemicals, Animal nutrition, Plastics fabrication and uses, Textiles, Fossil fuels, Derivatives and related products. The abstract content and weekly indexes are also available in five separate *CA* section groupings issued fortnightly. These section groupings are: Biochemistry;

Organic chemistry; Macromolecular; Applied chemistry and chemical engineering; and Physical and analytical chemistry.

In addition to *Chemical Abstracts*, which is also available on microform, CAS currently produces several other chemical information tools which appear in printed and/or computer-readable form. Computer-readable files in the following six subject areas cover about one half of the abstracts currently published in *CA*: Chemical-biological activities (CBAC); Ecology and environment; Energy, food and agricultural chemistry; Materials; and Polymer science and technology (POST). In October 1976, CAS introduced *CA Selects*, a series of fortnightly printed publications which provide a current-awareness service in some twenty areas of chemical science.

CAS began research and development of computer-based techniques for information handling in the early 1960s, perfecting a computer algorithm for generating a unique and unambiguous machine-language description of the two-dimensional structure and stereochemical characteristics of a chemical substance. This algorithm became the foundation of a computer-based system, the CAS Chemical Registry System, in which a permanent, computer-checkable CAS Registry Number is assigned to each unique chemical substance. All specific substances indexed in *Chemical Abstracts* since January 1965 have been assigned CAS Registry Numbers. The Registry Number identifies substances for the *Chemical Abstracts* index-processing system and provides controls for the systematic names published in the *CA* volume indexes. CAS Registry Numbers now appear in many primary publications and compendia and are used in chemical information files of several agencies of the United States Government.

In early 1977, the CAS Chemical Registry contained over 3.7 million specific substances and 6 million chemical names and associated molecular formulae.

About 1,500 specialists, including several groups in other countries, help prepare the abstracts. CAS has signed agreements with the United Kingdom Chemical Information Service, which annually produces some 19,000 abstracts together with their corresponding index headings. It has other agreements with various foreign organizations for the use of its products and has set up user groups in various regions of the world and organized training programmes for the users of its services.

Between 1967 and 1971, CAS abstracted and indexed 1.4 million documents, and about 2 million between 1972 and 1976.

Further information on CAS may be obtained by writing to: Chemical Abstracts Services, P. O. Box 3012, Columbus, OH 43210, United States of America.

Appendix 11. CAN/SDI

CAN/SDI (Canadian Selective Dissemination of Information), set up by the Canada Institute for Scientific and Technical Information, is a current-awareness service which keeps subscribers informed, on a continuing and regular basis, of recent publications in their particular fields of interest. This service was begun in 1969 and now provides access to the most current information from seventeen different indexing services in science and technology, social sciences and the humanities, through the subscriber's information profile.

The profile consists of keywords or names which inform the computer as to the exact

information the subscriber needs. Once a week, fortnightly or once a month, depending on the indexing service, the subscriber's profile is searched against the latest information in the indexing service chosen and the references retrieved and delivered to his desk.

The subscriber can write his own profile using the step-by-step instructions in the fifth edition of the *CAN/SDI Profile Design Manual* (available in English or French for \$20 a copy) or he can send the following information to CAN/SDI where a trained search editor will design the profile:

1. A narrative statement outlining specifically the subscriber's information needs.
2. The indexing service(s) to be searched.
3. A list of major keywords and phrases used in titles describing the subject.
4. Up to ten or more recent references on the subject.
5. The subscriber's name, address and telephone number.
6. A signed contract. The cost of a profile depends on the indexing service and the number of keywords.

CAN/SDI now has over 2,100 profiles. The active users of the system are in industry (9 per cent), universities (28.4 per cent) and government (59.5 per cent) with hospitals and other areas of work taking up the other 3.1 per cent. CAN/SDI is permitted to market several of the indexing services outside Canada with the result that 1.2 per cent of the users are from the United States or Europe.

One of the unique features of Can/SDI is that before offering an indexing service to subscribers, the Canada Institute for Scientific and Technical Information (CISTI) attempts to ensure that a reasonable literature back-up service exists to provide copies on request of the primary documents indexed. This is done through CISTI's own holdings, the holdings of other government libraries involved with CAN/SDI or the nationwide Interlibrary Loan Service.

Between 1975 and 1977, Unesco helped launch a number of SDI pilot projects for Member States. As part of this programme, national SDI services were established in Argentina, India and Mexico, using the CAN/SDI software developed by the CISTI and magnetic tapes supplied by Chemical Abstracts Condensates at special introductory offer prices. These three national services are now continuing without the support of Unesco and are gradually increasing the amount of material handled and the number of users served.

The success of this initiative and the interest in it shown by Member States have led Unesco and the CISTI to agree to disseminate the CAN/SDI programme as an integral part of the CDS/ISIS software that is already being disseminated through Unesco. The new CDS/ISIS-CAN/SDI software is suited to a wide range of documentary functions: the CAN/SDI contribution will ensure a good selective dissemination of information from internationally available bibliographic data bases, while that of CDS/ISIS will bring national and international data bases into play to facilitate bibliographic control and retrospective searches by means of on-line or batch processing.

Since 1979, the interested organizations in Member States wishing to set up computerized documentation services can, provided that their applications can be satisfied, sign an agreement to obtain the CDS/ISIS-CAN/SDI software. Unesco organizes appropriate international training in the use of this software and makes the necessary arrangements for its installation. These services are free of charge, though participating organizations are generally asked to pay for the travel and living expenses of trainees. For requests from developing countries, Unesco tries to find the financial support needed to pay for training and to arrange for preferential conditions of access to the data bases.

Further information of CAN/SDI may be obtained by writing to: CAN/SDI—Canada

Institute for Scientific and Technical Information, National Research Council, Ottawa K1A 0S2, Canada.

For information on the software, write to: Unesco, 7 place de Fontenoy, 75700 Paris, France.

Appendix 12. TITUS

The Textile Information Treatment Users' Service (TITUS) is a computerized international textile information system set up as a result of international co-operation centred on the Textile Institute of France. TITUS is a computerized system for data on textiles which operates under an agreement between various European and North American countries.

For data input and retrieval, four languages are used (English, French, German and Spanish), any of which can be used for indexing and the computerized translation of output.

The TITUS system offers a variety of services, including: (a) retrospective searches on any subject related to textiles, with or without specifications as to the year, language, country or type of document; (b) regular monthly SDI services to keep subscribers informed of all new documents connected with a particular subject of interest; (c) monthly standard SDI services for nineteen specific textile fields; (d) an on-line search service through the SDC network in the United States, Canada and Mexico and through the Cyclades telecommunication network (until Euronet comes into operation) in Western Europe; and (e) a monthly magnetic-tape service providing abstracts of all new documents acquired. In addition, textile specialists are on hand in every unit of the network to give advice and to help users formulate queries to be addressed to the TITUS system.

Preparation and automatic translation of the abstracts. The TITUS II system makes use of a procedure whereby the abstracts are drafted by means of a controlled syntax based on twenty-two models of standard sentences and a transformational grammar for each language which converts this entry language—very close to natural language—into the special highly condensed 'intermediate language' used for storing the records in the data base.

For retrieval, the abstracts are translated automatically with the help of generalized grammars which turn the intermediate language back into natural language sentences for output. Familiarity with the syntactic components of all the memorized references further makes it possible to conduct much more discriminating searches and introduce the syntax into the search formula.

Coverage. All specific and technical information pertaining to textiles, from the production and structure of textile fibres to the processes, machines and treatments used in manufacture.

Data sources. These comprise periodicals, books, patents, standards, theses, symposium proceedings, manufacturers' reports and notifications.

Data base. Since 1968, about 25,000 documents a year have been stored in computer files with direct access on visual display units (on-line access) or on punched cards (batch mode). Textile specialists make a thorough abstract of each original document, assigning keywords and grammatical relationships for roughly 11,000 words of the working languages employed, as well as taking other parameters into consideration.

Computer and information-processing equipment: TITUS utilizes a Siemens 7730 computer with a special software known as TITUS II.

Access. The services are available to all, either as subscribers or on an individual search basis.

Participants. Besides the Textile Institute of France, at Boulogne-sur-Seine, the other centres involved in data collection are: (a) Zentralstelle für Textildokumentation und Information (ZIDI) beim Verein Deutscher Ingenieure, in Düsseldorf, Federal Republic of Germany; (b) Centre Scientifique et Technique de l'Industrie Textile Belge (CENTRE-XBEL) in Brussels, Belgium; (c) Escuela Técnica Superior de Ingenieros Industriales, at Tarrasa, Spain; (d) the Shirley Institute in Manchester, United Kingdom; (e) the Stazione Superimentale per la Cellulosa in Milan, and the Stazione Sperimentale per la Seta in Cormanò, Italy; (f) the Textile Information Users' Council, in New York, United States of America.

For further information, write to: Institut Textile de France, 35 rue des Abondances, 92100 Boulogne-sur-Seine, France.

Appendix 13. TYMNET

TYMNET is a computerized telecommunication network which came into operation in 1971. It is at present managed as a commercial undertaking by a company of the same name.

Briefly, it includes communication lines connecting the various nodes of the network. These nodes are computer systems which dispatch the traffic to other nodes (TYMSAT), relay it to host computers (TYMCOM) or are host computers in their own right. Users are linked to the nodes by telephone lines, as are the data bases and processing centres. In addition, the system has a supervisor, that is, a programme for regulating the traffic in the system, which can operate from several nodes.

The system, which began with about thirty nodes, now has around 200. Most of them are in the United States, but they are also to be found in Canada, Mexico and Western Europe.

These nodes provide access to nearly a hundred data bases, covering a wide range of fields such as agriculture, education, medicine, chemistry, social sciences, economics, etc. The user subscribes to TYMNET and to the services he intends to call upon. All he has to do is to telephone the nearest TYMSAT connection node and, once he has got through, to connect his terminal to the telephone. After the inquirer's identity has been checked, he is connected to the service requested. The data bases are searched by the users and the answers are displayed on his terminal.

The system works with a great variety of computers and employs traffic modulation devices such as multi-address messages, on-line storage of commonly used message data and the saving of recent messages, it uses packet-switching technology.

The system makes a full bookkeeping record of all transactions, which is sent to users each month.

Further information on TYMNET may be obtained by writing to: TYMNET Inc., 10261 Bubb Road, Cupertino, CA 95014, United States of America.

Appendix 14. EURONET

EURONET is an on-line information network of the European Communities.

The network

The decision to set up EURONET, officially taken by the Council of the European Communities on 18 March 1975, aimed at:

Providing the user anywhere in the Community via screen or printer with direct access to scientific, technical and socio-economic data.

Integrating existing and future on-line information services in the community into a commonly shared network on a co-operative basis.

Making available for the first time a large variety of services operated on widely differing host computers in many different countries, via one single network.

EURONET's basic component is an efficient international data-transmission network, the first such system to be set up jointly by the PTT Administrations of nine member states, and so to constitute a major breakthrough in international data communication. Using modern packet-switching technology, this network will link information centres and user terminals, in both the public and private sectors, throughout the Community.

EURONET was opened to the public at the beginning of 1979 and now has around 100 data bases, covering a very wide range of fields from medicine to agriculture, available on-line to the users.

The Community is striving to assist the development of a number of selected European data bases, in particular to enable them to operate on-line and to be upgraded from a national operation to an international environment. Fields which are not yet adequately covered in Europe are the object of special studies, in particular some aspects of energy, environment and agriculture. Patent literature, documentation and industrial information are also being investigated.

Further developments

The second three-year (1978-80) plan of activities in the field of scientific and technical information, submitted by the Commission to the Council, includes measures to make EURONET a user-oriented network; studies have been launched to elaborate a common command language for most data bases, while the transfer of information between the languages of the member countries of the Community is the object of a comprehensive development programme financed on Community funds; further, the new technologies used in EURONET should enable the PTT Administrations to offer telecommunication charges for data-transmission much lower than current rates.

International aspects

Applications for participation in EURONET have already been received from neighbouring European countries and are being considered by the proper authorities; it is also envisaged that EURONET could—though at a later date—benefit some developing countries: trainees from several of these countries have visited Europe for this purpose and this training will be continued.

Further information on EURONET may be obtained by writing to: The Commission of the European Communities, Directorate General 13, Scientific and Technical Information and Information Management, Bâtiment Jean Monnet, Kirchberg, Luxembourg.

19 Standardization

Standardization is the collective effort through which standards are established. A standard is a kind of rule, usually for guidance but sometimes mandatory (at least in practice), which defines the specifications and use of an object or the characteristics of a process and/or method.

The nature and purpose of a standard can be illustrated by an example. If all the world's waterpipes and taps were manufactured with different diameters, they would be quite impossible to connect up without adaptors. With each manufacturer taking excessive advantage of his freedom, the result would be an enormous wastage, the market split up into isolated segments and possibly even general paralysis; on the other hand, if they came to an agreement on the models and sizes required (i.e. on standardization) this would simplify production, extend the market and make the products interchangeable and capable of being connected up to each other.

Standardization in the field of scientific and technical information is just as vital as in other fields; indeed, its importance is increased by the fact that co-operation between information units is absolutely essential. It affects their equipment, their documentary products and their intellectual tools and makes it possible to simplify and rationalize their methods and techniques and harmonize their products. This in turn facilitates documentary operations, reduces costs, cuts down delays and permits exchange.

Types of standard

Standards can be physical, i.e. measurable and quantifiable (fixed dimensions), and/or intellectual, i.e. qualitative (a definition). There are several types:

Size (e.g. the size of cards or the dimensions of equipment).

Quality (e.g. the strength of paper).

Standardized definitions, vocabularies, terms and symbols (e.g. standards for transliteration, symbols for records).

Standardized procedures and methods (e.g. standard rules for handling a particular device, standards (or 'guidelines') for preparing and presenting a thesaurus).

Fields of application: information units apply standards to:

The presentation of documents (e.g. periodical publications).

The processing of documents (e.g. cataloguing rules).

Transliteration, or conversion of characters from one language into another, such as Arabic script into the Latin alphabet.

Premises and equipment (e.g. the floor-area of a library or the dimensions of bookshelves).

Reproduction (e.g. standards for microcopies).

Terminology (e.g. standardized vocabularies).

Computer applications (e.g. standards for data carriers, programming languages, operation of the machines ('digital command'), etc.).

Standardization organizations

At the national level, these organizations comprise: (a) special offices or services for each branch of activity; (b) a national standardization body, sometimes with official status, which centralizes, co-ordinates and disseminates the work of technical services and represents the country in the international organizations; and (c) sometimes a higher authority attached to the national administration (e.g. a national bureau of standardization) which directs, at the highest level, the application of standards.

At the international level, the principal world organization is the International Organization for Standardization (ISO), which covers all fields of activity. Two ISO bodies are particularly concerned with standardization in developing countries: DEVCO, a committee on development, and DEVPRO, a standing co-ordination bureau for promoting standardization in developing countries.

Other world organizations deal with special sectors (the International Electrotechnical Committee for electronics, the International Telecommunication Union for telecommunications) and there are some based on regions (e.g. the European Committee for Standardization); they all work closely with the ISO.

The ISO, through nearly 200 specialized technical committees with representatives from each member country, is very active in: (a) the elaboration of new standards or 'recommendations' or the revision of outdated ones; (b) the exchange of information between member organizations; and (c) the dissemination of standardization documents.

Around 100,000 experts co-operate with the ISO, which has already promulgated over 3,000 standards. It co-operates actively with the UNISIST programme, chiefly through its ISO/TC 46 Technical Committee on 'Documentation', in conducting studies and joint action (for example, ISDS, ISSN, thesaurus guidelines). Recently it joined with Unesco in setting up a network for information, studies and training relating to all standards (ISONET) and a specialized centre for standards in the field of information and documentation (ISODOC).

The ISO has an information centre at its General Secretariat in Geneva and a Standing Committee for the study of scientific and technical information in the field of standardization (INFCO). INFCO was in fact made responsible for preparing and setting up ISONET.

A new standard must always correspond to a specific need. It represents the outcome of continuing co-operation between the producers, distributors and users of the products or processes concerned.

It takes shape gradually, in stages:

A suggestion is outlined in a working document.

A draft standard is prepared after consideration of the suggestion, a series of technical studies and comparison with existing standards.

A public inquiry is organized by the specialized national agencies: the draft standard is circulated in the country and abroad, reactions are assessed and a final version prepared.

The new standard is applied experimentally and if necessary a definitive version drafted after this trial period.

'Ratification', or official recognition: the new standard is presented to the bureau of standardization, its acceptability is if necessary checked by the country's competent authorities and, for countries in which standards have an official status, a decree or order is signed and published in the official journal.

The dissemination of standards is the responsibility of the international standardization body concerned, which publishes them in a periodical bulletin (usually a monthly) and communicates them to the press. It is this bulletin which keeps people informed as new standards appear.

For information on existing standards in a particular field, it is possible to consult the *Catalogue of Standards*, which is regularly updated by the ISO. The general public can also utilize the comprehensive ISO collections of standards in use through the world, a special library and an International Information Centre on Standards in Documentation (ISODOC) at the Secretariat of the ISO/TC 46 Committee in West Berlin.

Lastly, certain countries have established computerized data banks on standards, such as NORMADOC and NORMATERM of the Association Française de Normalisation (AFNOR) in France.

The use of standards is not mandatory, except in certain particular cases (safety, government contracts), since they imply rules which may conflict with local customs and individual habits and impose changes, and hence expenditure. They serve as guidelines and often apply only to the essential aspects of a product or process so that users can adapt more flexibly. Unfortunately, they still cover only a small portion of scientific and technical information. None the less, compliance with established standards presents considerable advantages: the money, time and labour saved easily offset their inherent constraints. In each case, a person should check whether there exist one or more applicable standards. Occasionally he might have to choose between several standards (for example, a standard of the international information system, a national standard, an international standard).

Preference should be given to the one which contributes most to the information unit's objectives and/or efficiency and is most suited to the national situation. Accordingly, its conditions of application to the products or processes in question should be carefully examined, including any adjustments that might be required.

The criteria for assessing the effectiveness of a standard are: (a) the degree to which it meets the needs for which it was designed; (b) ease of application; (c) precise and unambiguous instructions; (d) acceptability for the user; and (e) the same results when applied by different people in different countries and situations.

Changes of standards reflect new techniques and needs. If a standard becomes pointless it can be rescinded. When necessary, it can be slightly or extensively modified (amendment or full-scale revision) or be replaced by a new and more appropriate standard.

Check questionnaire

- What is a standard?
- What are the different types of standard?
- What are the advantages of standardization?
- What is the ISO?
- Can a standard be revised?
- Are standards mandatory?
- What is ISONET?

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Appendix. Examples of standards

FASCICULE DE DOCUMENTATION	CATALOGUES ALPHABÉTIQUES D'AUTEURS ET D'ANONYMES - PRÉSENTATION MATÉRIELLE DE LA NOTICE CATALOGRAPHIQUE	NF Z 44-051 Novembre 1976
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J. BRARD - 00110 Meru	NF Z 44-051 1 ^{er} TIRAGE 76-11	© AFNOR 1976 Droits de reproduction et de traduction réservés pour tous pays.

Alphabetical list of authors and of anonymous works - Presentation of catalogue entries
Alphabetische Verfasser - und Titeltataloge - Richtlinien für die Einrichtung der Titelaufnahmen

TC 46

	Documentation	Documentation
	UDC 002/050 + 778.14	CDU 002/050 + 778.14
ISO 4-1972	4 Documentation -- International code for the abbreviation of titles of periodicals	Documentation -- Code international pour l'abréviation des titres de périodiques
ISO 8-1977	4 Documentation -- Presentation of periodicals	Documentation -- Présentation des périodiques
ISO/R 9-1968	2 6 International system for the transliteration of Slavic Cyrillic characters	Système international pour la translittération des caractères cyrilliques slaves
ISO/R 18-1956	1 Short contents list of periodicals or other documents	Sommaire de périodiques ou d'autres documents
ISO/R 30-1956	2 Bibliographical strip	Manchette bibliographique
ISO 214-1976	6 Documentation -- Abstracts for publications and documentation	Documentation -- Analyse pour les publications et la documentation
ISO/R 215-1961	2 Presentation of contributions to periodicals	Présentation des articles de périodiques
ISO/R 233-1961	5 International system for the transliteration of Arabic characters	Système international pour la translittération des caractères arabes
ISO/R 259-1962	5 Transliteration of Hebrew	Translittération de l'hébreu
ISO 435-1975	3 Documentary reproduction -- ISO conventional typographical character for legibility tests (ISO character)	Reproduction documentaire -- Caractère typographique conventionnel ISO pour essais de lisibilité (caractère ISO)
ISO 446-1975	3 Microcopying -- ISO No. 1 Mire -- Description and use in photographic documentary reproduction	Microcopie -- Mire ISO no 1 -- Description et utilisation dans la reproduction photographique des documents
ISO/R 452-1965	3 Essential characteristics of 35 mm microfilm reading apparatus	Caractéristiques essentielles des appareils de lecture pour microfilms de 35 mm
ISO 689-1975	4 Microcopying -- ISO micromire -- Description and use for checking a reading apparatus	Microcopie -- Micromire ISO -- Description et utilisation pour l'examen d'un appareil de lecture
ISO 690-1975	8 Documentation -- Bibliographical references -- Essential and supplementary elements	Documentation -- Références bibliographiques -- Éléments essentiels et complémentaires
ISO 782-1975	4 Microcopying -- Measurement of screen luminance of microfilm readers	Microcopie -- Mesurage de la luminance des écrans d'appareils de lecture
ISO 832-1975	38 Documentation -- Bibliographical references -- Abbreviations of typical words Bilingual edition	Documentation -- Références bibliographiques -- Abréviations des mots typiques Édition bilingue
ISO 833-1974	38 Documentation -- International list of periodical title word abbreviations	Documentation -- Liste internationale d'abréviations de mots dans les titres de périodiques
ISO/R 843-1968	3 International system for the transliteration of Greek characters into Latin characters	Système international pour la translittération des caractères grecs en caractères latins
ISO 999-1975	2 Documentation -- Index of a publication	Documentation -- Index d'une publication
ISO 1086-1975	2 Documentation -- Title-leaves of a book	Documentation -- Feuilles de titre d'un livre
ISO 1116-1975	6 Microcopying -- 16 mm and 35 mm microfilms, spools and reels	Microcopie -- Microfilms de 16 mm et de 35 mm et leurs bobines d'alimentation et de lecture
ISO 2108-1972	2 Documentation -- International standard book numbering (ISBN)	Documentation -- Système international pour la numérotation des livres (ISBN)
ISO 2145-1972	2 Numbering of divisions and subdivisions in written documents	Numérotation des divisions et subdivisions dans les documents écrits
ISO 2146-1972	2 Directories of libraries, information and documentation centres	Répertoires de bibliothèques, de centres d'information et de documentation
ISO 2384-1977	4 Documentation -- Presentation of translations	Documentation -- Présentation des traductions
ISO 2707-1976	2 6 Microcopying -- Transparent A6 size microfiche of uniform division -- Image arrangements No. 1 and No. 2	Microcopie -- Microfiche transparente de format A6 à partition uniforme -- Dispositions d'images no 1 et no 2
ISO 2708-1976	2 8 Microcopying -- Transparent A6 size microfiche of variable division -- Image arrangements A and B	Microcopie -- Microfiche transparente de format A6 à partition variable -- Dispositions d'images A et B
ISO 2709-1973	4 Documentation -- Formats for bibliographic information interchange on magnetic tape	Documentation -- Disposition des données sur bande magnétique pour l'échange d'informations bibliographiques
ISO 2788-1974	13 Documentation -- Guidelines for the establishment and development of monolingual thesauri	Documentation -- Principes directeurs pour l'établissement et le développement de thésaurus monolingues
ISO 2789-1974	4 International library statistics	Statistiques internationales de bibliothèques
ISO 3166-1974	22 Codes for the representation of names of countries Amendment 1-1977	Codes pour la représentation des noms de pays Amendement 1-1977
ISO 3272/3-1975	4 Microcopying of technical drawings and other drawing office documents -- Part III : Unitized 35 mm microfilm carriers	Microcopie des dessins techniques et autres documents de bureau d'études -- Partie III : Microcopies unitaires sur film de 35 mm
ISO 3297-1975	4 Documentation -- International standard serial numbering (ISSN)	Documentation -- Numérotation internationale normalisée des publications en série (ISSN)
ISO 3334-1976	4 Microcopying -- ISO Test chart No. 2 -- Description and use in photographic documentary reproduction	Microcopie -- Mire ISO no 2 -- Description et utilisation dans la reproduction photographique des documents
ISO 3388-1977	29 Patent documents -- Bibliographic references -- Essential and complementary elements	Documents de brevets -- Références bibliographiques -- Éléments essentiels et complémentaires

20 The user

The user is the focal point of all information systems, whose sole *raison d'être* is to facilitate the transfer of information between two or more interlocutors, however distant from each other in space or in time.

The concept of user is still, however, by no means clear. For some people, the user is only encountered at the end of the documentary chain, when he asks, for example, for a primary document or a bibliographic search. In systems exploiting large machine-readable data bases, the user is the person who searches them and hence, in practice, usually one of the information unit's full-time information specialists. Some regard the user as both client of information services and producer of information, while others see him as an integral part of the information system: producer and client, and, for certain communications, relay and agent.

The roles of all those concerned with information are complex and changing. A scientific journalist, for example, could be at once, and often almost simultaneously, a producer of information through his articles, which will subsequently be processed by the information unit, a user of referral and bibliographic search services when seeking documents to help with his articles, a partner of the information unit when he repackages information and produces syntheses, a dissemination agent when he addresses his audience and skilfully communicates his message to his public, and a person with responsibilities through his opinions and/or position and through the resources, policy and programme of his journal's information unit.

For the sake of convenience we shall stick to the term 'user', but it is important to bear in mind the many roles he plays and to allow for this when formulating policies.

The role of the user

The user's role intervenes at several levels. In most cases it takes the form of a two-way interaction with the information units. In the first place, an information unit often owes its continued existence, its resources and its policy to the user: directly when he is a decision-maker or indirectly when he is a member of the executive body of the parent organization or has relations with it as client and/or taxpayer. The general

orientation and design of information units and systems are always founded on the user and should reflect his characteristics, attitudes, needs and demands.

The user is involved in most operations of the documentary chain: he knows certain sources of information which he is able to weigh up and communicate; he can contribute to the selection of, and sometimes even decide on new acquisitions; he can facilitate access to non-conventional literature, about which he is more directly informed; he can, and in fact should, help develop some of the working tools such as the documentary language, analysis grids, file structure and formats; he may or may not be closely associated with contents description, the formulation of search strategies and the evaluation of search results. And naturally he utilizes the products and services of the unit and states what he wants and how it should be presented. He also produces information and documents and, through his personal contacts, plays an active part in the circulation of information.

In short, the user is essential to the design, evaluation, improvement, adaptation, stimulation and operation of any information system. He represents a dynamic influence but in some cases, when unfamiliar with the information process or reluctant to share his knowledge, he may resist change.

The dialogue between information specialists and users is not easy to establish. Both sides have to learn to trust each other and overcome simplistic or erroneous preconceptions. Many users still do not regard information activities as a series of specific tasks calling for specific technical skills and teamwork. They want the informations for themselves alone and pay little heed to the information units and their staff. As for the latter, they tend to retreat into the technical aspects of their work, paying more attention to conservation and storage than to dissemination, and neglecting the real needs of the users.

This situation can be remedied:

If information specialists realize that the purpose of their profession is to serve the users, whose needs they must want and be able to detect and formulate as a specific request, and are willing to adapt their services to changes in demand and techniques, and to co-operate with users.

If the user understands the demands of modern knowledge transfer techniques, accepts the discipline they impose, and is willing to delegate tasks to information specialists, to trust them, and to undergo suitable training in information techniques.

For a long time, information units could only offer users a substitute for information in the form of primary documents or references. Technical progress is now making it possible to devote increasing resources to the provision of more practical, directly usable and made-to-measure services such as SDI, on-line searching and liaison services. However, there is still a long way to go before users will be fully integrated into the information systems.

Types of user: two kinds of criteria are employed in defining them:

Objective criteria, such as socio-professional category, specialist field, nature of the activity for which the information is sought, reason for using the information system.

Social and psychological criteria, such as the user's attitudes and values in regard to information in general and in his relations with information units in particular, the reasons behind his particular information-seeking and communication behaviour and his professional and general social behaviour.

Certain broad types of user can be identified:

Users not yet engaged in active life, such as students.

User with a job and whose information needs are related to their work. They are classified by main activity (management, research, development, production, services), by branch of activity and/or specialist field (civil service, agriculture, industry, etc.) and by level of education and responsibility (professional staff, technicians, workers).

The ordinary citizen needing general information for social purposes.

Information needs do not always follow a standard pattern, partly because the collection and processing of information are not isolated activities but constantly intermingled with all the other activities of each individual, and partly because each individual takes in a vast quantity of information or has already absorbed a great deal from his training and personal experience. These needs, moreover, change with the user's work and with the passage of time.

Once the need for information has been recognized, a way must be found to satisfy it. The first step is to determine its scope and the subjects concerned, then the form of presentation (original documents or abstracts) and the communication channel (written, oral, delivered to the user's place of work or obtainable by the user somewhere else). One must also know how much information is needed, the frequency of transactions, and how much time there is to provide the various types of information.

On each occasion, a user or type of user tends to prefer his information in one form rather than another. His choice will depend on his education, his hierarchical position and relations, his confidence in the various sources, his material situation and working habits. An architect, for example, would much prefer a photograph or sketch of a house to a written description which he might even reject outright.

Information-seeking behaviour, or how a user goes about seeking and obtaining information, is often confused with information needs, despite the fact that the two concepts differ from a structural point of view.

A large proportion of scientific and technical information—about half, though it varies with the branch—is produced, circulated, retrieved and exploited independently of information units. It is therefore important to know these circuits, gauge their reliability and perceive their advantages so that the planning and operation of an information unit's services can benefit from their experience and work in close co-operation with them.

The user's information behaviour is reflected in his relationship to the information unit and their various products and services. How much does the user already know? How does he select his sources? How does he formulate his queries? How does he choose his information?, and so on.

His behaviour is influenced by a number of factors, such as his education,

whether or not he has been taught how to use the products and services of information units, the accessibility of the units, his working conditions and amount of time available, his hierarchical status and socio-professional position, how easily he gets on with people, how much competition there is between members of a group, the attitude of each individual and group to information, previous experiences, etc.

The relationship between users and information units depends on the former's information needs and behaviour, the unit's success in giving satisfaction and its general policy towards users.

In many cases, even when the service provided is in tune with real needs, the actual number of users falls far short of the potential clientele. There are both material and psychological reasons for this. Students and research workers utilize information services much more than do practical workers, in the first place because these services often correspond more closely to their concerns and secondly because they are still designed essentially for this type of user. Practitioners need precise data quickly—just lists of references—but the services designed for this type of client are still few in number and of relatively recent origin.

Users are chiefly encountered when they have need of information services. They do not usually take much part in the other activities (design and evaluation of the services, acquisitions, processing operations, etc.). Despite the fact that their role is central in the creation, maintenance and utilization of information units, the decisions involved are all too often based on general considerations rather than on an analysis of user needs and the unit's objectives (except for large organizations) in branches where knowledge is constantly developing.

The fact is that information specialists and users should maintain as close and diversified a relationship as possible. The unit should be located as near the users as possible but, even more important, be intellectually in tune with their interests. If users, for their part, are to regard it as a useful tool, it should be sufficiently dynamic, open-minded and effective to produce tangible results for them. The unit must do its utmost to understand fully the user's real needs, to recognize their changing pattern, to assess user satisfaction, and to adapt as necessary. This calls for studies on needs and behaviour (see below), but also for as much personal contact as possible with the user, whose opinions, criticisms and suggestions should be sought and heeded. This can be done through informal talks, meetings, simple questionnaires and regular visits.

Obstacles to communication

Even though communication is the fundamental characteristic of human societies, it comes up against a number of complex obstacles which, in various guises, affect individual and group contacts and their relationship with information systems. They have various causes:

Institutional impediments: the status of persons and organizations, hierarchical structures or the fact that some information is secret.

Financial impediments arising from the cost of information: for example, an air-mail subscription costs twice as much as one by surface mail but with the latter the information arrives too late and loses almost all its interest.

Technical impediments, such as the need for reading devices to consult certain documents, the deterioration of information through inappropriate processing (for example, a contents description that is too superficial or gives too little information) or through the poor presentation of documentary products (overlong or badly organized index, time-consuming access to documents, poor legibility, etc.), not enough copies of documents, poor query formulation, the user's ignorance of information-retrieval procedures and the time they take, underqualified information specialists, and so on.

Linguistic obstacles: in all countries, a large proportion of potentially needed information is in languages unfamiliar to many users.

Social and psychological obstacles, which are very important where the user is concerned: wariness and reluctance to co-operate with information specialists; unwillingness to have habits changed by formalized information procedures; rejection of the constraints and discipline inherent in an organized circulation of information; questions of prestige (very inappropriate: the refusal to ask oneself questions is more a sign of incompetence than of expertise!) and the conscious or subconscious desire to safeguard the power conferred on the possessor of information; the refusal to admit to ignorance and above all that someone else may know better, etc.

Where the information specialist is concerned: mistrust of users, ignorance of, and even indifference to, their real needs, inflexible procedures, conflicting roles, etc.

Although some of these obstacles escape the control of both users and information specialists, many of them can be reduced or even eliminated by appropriate measures, by an open-minded attitude on both sides and by regular contact.

User satisfaction can be gauged indirectly by how often they come to information units and utilize their various services. If they have to pay, even very little, for these services, these indicators will be even more significant. But careful attention must be paid to the overall situation: the user might well be satisfied with the service simply because he does not know or cannot utilize other units. For example, he might find it reasonable for a unit to take a month for a retrospective bibliographic search if on-line search services are unavailable, but this does not mean that a month represents a good performance.

This explains why units attempt to measure user satisfaction directly, either by means of periodic studies or by systematically seeking the opinions of users.

User satisfaction depends on a number of factors: (a) the speed of the service (the time taken to signal a new piece of information or answer a query); (b) the ratio of queries satisfied to queries presented; (c) the precision ratio (the proportion of relevant information supplied); (d) the novelty of the answers or information provided (the proportion of information not already known to the user); (e) exhaustivity (the degree to which the service covers all aspects of the query, or to which the unit provides all the services needed); (f) the amount of user effort

required to utilize the various services: complexity of procedures, time taken, price paid, relative convenience of the communication channels, legibility, attractiveness and simplicity of presentation, etc.

User studies generally aim at three complementary objectives:

First, the analysis of needs or, in other words, the type and nature of the information sought and accepted, from both a quantitative and qualitative point of view.

Knowing this, one can define the most suitable products, services and even type of information unit for a particular situation.

Second, the analysis of information behaviour, which shows how most needs are satisfied, casts light upon the context in which the products and services are provided, clarifies the conditions they have to fulfil and indicates the type of preparation and/or training that users need.

Third, the analysis of motivations and attitudes, that is, of the user's values, of his expressed or concealed expectations in regard to information and related activities, and his image of information services and specialists, etc. This will bring out the deeper reasons for his particular behaviour and needs.

Studies of this kind may also serve to further theoretical knowledge and explore, for example, the sociology of organizations, communication or science. Their practical value is to provide the basis on which a product or service—or even a complete information system—can be designed or reshaped for a particular clientele. They are therefore undertaken before a new unit or service is established or when it is in operation.

Methods of user study

The methods are those of social psychology, and include: questionnaires; carefully structured interviews; collection of data from the unit's control records (loans file, register of requests for photocopies, etc.); observation of behaviour; examination of diaries in which users are asked to note, over a brief period, all their information-related activities; analysis of documents produced by the users; administrative documents (workplans, job descriptions, etc.); non-structured interviews, the study of certain complex cases (how the information needed for a recent task was obtained); and the testing of new products or services or of new forms of presentation or access.

In many cases, several of these methods have to be employed in conjunction. The actual approach will depend first on the data wanted and secondly on whether, in practice, they can be obtained by these means at a reasonable cost, bearing in mind available resources and how the results can be used. Such studies are a job for specialists, who should be made entirely responsible for them or at least closely supervise their planning, implementation and exploitation.

Quantitative data, though always necessary, are not enough to gauge the actual operation of services or circulation of information. For example, the fact

that the number of subscribers to a current-awareness bulletin increases by 10 per cent annum does not necessarily mean that more use is being made of it: there could be more organizations ordering it as a matter of course without actually consulting it. Quantitative data, therefore, have to be backed up by qualitative information. This raises problems of interpretation: the recipients of the bulletin might well state, simply out of courtesy, that they find it interesting or that they consult it often, when this is not in fact the case. Hence the need for cross-checking, which takes a great deal of time. Nevertheless, such surveys are indispensable; within certain limits and provided that they are well designed, they can yield valuable indications.

The promotion of information units serves to bring the units and their services to the attention of potential users, to get across the likely benefits and to obtain their participation and support. Various techniques are used, such as guided tours, personal contacts, posters, advertisements in newspapers, the provision of services on a trial basis, etc.

These techniques should bear in mind the target clientele and the unit's objectives and, whatever form is chosen, a sustained effort is required.

User education and training

Here the aim is to explain the mechanisms of information and to teach users how to exploit the resources available. It can be organized at several levels:

Efforts to improve general awareness rather than practical know-how.

A brief introduction to information resources and how to use them.

Training: i.e. more detailed instruction in the use of available resources and the operation of the modern tools employed in documentation and information.

Special training in how to use or even contribute to a particular service.

It is now generally agreed that the training of users should begin at school and form an integral part of an individual's basic education, so that it can be supplemented when necessary by subsequent specialized training. Unfortunately, for lack of means and because human societies have not yet fully grasped the new importance and scope of information, this is not done. Recently, however, a number of countries have been making significant efforts to improve the situation at all levels.

User education and training, though provided for in some educational curricula, is still in many cases left entirely to the information units or to national or international professional organizations.

Such training, without entirely disregarding the theoretical side of the information sciences, should concentrate on their practical aspects. Depending on its objectives and local conditions, anything from a few to around forty hours will be needed, in the form of training courses, seminars or practical experience, etc. There should be no attempt to exchange roles by turning users into information specialists. The aim should be to describe and explain the processing techniques and

operations of information units in order to improve their grasp of how the products and services can be exploited and, in some cases, of how they themselves can contribute.

Although essential, user education and training is still hindered by the lack of means and conscious or subconscious opposition of both information specialists and users. Each side must be persuaded of the long-term advantages of questioning settled habits and relationships.

Check questionnaire

- What roles do users play in the communication of information?
- What are the impediments to documentary communication?
- What is the purpose of a user study?
- What are the criteria for evaluating the services of an information unit?
- What are the main objectives of user education and training?
- How is user satisfaction gauged?
- What is the purpose of promoting an information unit?
- How is it done?

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21 Management and policies of an information unit

Management is the process of directing individual skills and energies and allocating material resources to attain an objective. It can also be regarded as a set of techniques for reaching rational decisions ensuring that all available resources are fully utilized in their implementation, and checking their effectiveness.

These techniques are based on: quantitative methods, or the use of measurements that are as objective as possible, the need for efficiency, the careful preparation of decisions in accordance with firm criteria, and teamwork and leadership.

Modern management is also a state of mind and an attitude to work centred on effectiveness and rationality. It cannot be effective unless all members of the group or organization feel involved: each individual has a vital role to play and must therefore understand its principles while accepting that the final decision at each level must be the clear responsibility of a particular person or group of persons.

Owing to their wide range of activities, their human and material resources, rapid technical progress and, above all, the many different functions they have to perform in backing up the productive activities of their users, information services must lay great stress on management.

Management

Management deals in varying degrees with: (a) all the personnel and all the material components of an organization; (b) all its activities: routine tasks (the sale of products and services), or organization of the whole (staff promotion regulations). This does not mean to say that management is concerned with all the minor details that crop up.

The purpose of management is to enable the organization to produce the best possible results under the best possible conditions. The world situation today is so difficult and changing that no organization can attain this objective by relying on habit or intuition. There must be a systematic effort: (a) to analyse situations; (b) to define objectives; (c) to select the most economic means of attaining them; (d) to organize resources in consequence; (e) to monitor results; and (f) whenever

the need arises to adapt the objectives, resources and organization in the light of the results obtained, new circumstances and new tasks.

Policies are guidelines or general principles which help to express objectives in terms of actions by establishing codes for the taking and implementation of decisions.

The structures of an organization are an essential concern of management, whatever its size. Indeed, the smaller it is, and therefore the more limited its resources, the more efficiently it must be run. These structures form a complex whole and can be regarded:

As internal (organization of the various subdivisions and assignments of tasks) and external (links with the parent or other organizations).

As functional (arrangements for the proper execution of tasks) and relational (links between the subdivisions of the organization).

Communications are very important in the life of any information unit, yet they give rise to a great many problems. There are various types of communication:

Vertical communication, that is, from top management down through each level of responsibility, or from the bottom up.

Horizontal communication, between people with the same level of responsibility, or of different levels when hierarchical considerations are ignored.

Controlled (or official) communication, from a person in authority and in the proper form, as against spontaneous communication.

Formal communication, which uses specific predetermined channels, forms and carriers, as against informal communication.

Communications that differ in content (administrative or technical), in target (internal or external, individual or general communications), in purpose (an instruction, the minutes of a meeting), and in form (oral, written, posters, etc.).

Management must pay special attention to communication in order:

To ensure as far as possible that the organization disposes of all the types of communication needed for it to function smoothly.

To establish communication circuits that cover all needs, are as direct and short as possible, familiar to all staff and fully utilized.

To see that the communication work smoothly, i.e. that there are no breakdowns, that people are not by-passed and that the messages fulfil their functions, come from a competent authority and are put into effect.

The management and policies of any information unit must deal with the following areas: organization of services, personnel, equipment, collections, services for users, production, relations with users, relations with the parent organization and relations with other organizations (especially other information units).

The responsibility for management lies with the head of the information unit. In most cases it is, at a certain level, shared with higher authorities outside the unit itself (the directors of the parent organization) or not involved in its daily routine (the board of governors or advisory committee of a large unit). When the unit is large enough, managerial responsibility is also shared with the heads

of each section and the staff. All staff members in fact have some say in the various aspects of management, even though general supervision, evaluation of activities, and choice of policies and plans are the responsibility of senior staff.

The legal status of a unit affects its choice of policy. Some units come under public administration and must therefore respect official regulations which are not always geared to their managerial problems; moreover, they must provide the same quality of service for all users, in many cases free of charge, or respect certain general obligations (preservation of the national heritage, for instance) which can limit their freedom of action.

Other units are private concerns and operate in a context of competition. For example, certain information searches from external sources might reveal the commercial strategy of the firm.

Many information units have been set up to serve the information needs of a larger organization. Their problem is to know how far they can serve users from outside the parent organization and what links can be established with other units.

Lastly, certain units from the start, or soon afterwards, depend entirely on the proceeds obtained from selling their services and are therefore restricted to profitable activities.

Policies have to be formulated, and regularly updated, for the main aspects of the unit's work. Their purpose is to provide the clearest possible guidelines on: the target clientele; priority needs; the limits and scope of the unit's field; the types of services; the creation and management of collections, the nature and organization of technical operations; relations with users; the use of material resources; personnel management; the system of administration; relations with other units and with the parent organization, etc.

The analysis on which policies are based must not be restricted to the unit alone but take into consideration all aspects of its current environment and how this is likely to develop, including the branch of activity with which the unit is concerned, the national and international information infrastructure, information technology and so forth. This will make it possible to clarify the user services to be provided and the most effective methods not only for immediate purposes but in the longer term. It should also be stressed that policies cannot be formulated unless user needs have been adequately defined.

Planning is the means whereby the unit's resources are marshalled over a given period of time in order to attain predetermined objectives.

Plans and programmes can be regarded from two points of view:

First, their time-span: for example, a unit might have a long-term plan to develop into a specialized national documentation centre and the hub of a full-fledged network, medium-term plans for the successive stages involved, and short-term plans for expanding each service in the context of these stages.

Secondly, their scope: for example, a strategic plan covering the full development of a system designed to satisfy 80 per cent of potential users, operational plans for establishing a range of services (such as the selective dissemination of information), and functional plans covering particular tasks in a given stage of

the unit's development (such as the intellectual processing of documents with a view to building up a minimal data base).

As all these levels are naturally interdependent, more complex and comprehensive plans must be drawn up, or at least outlined, before the others.

The plans of an information unit must be consistent both with those of the parent organization (which are in turn geared to plans for the branch of activity concerned and the national plans) and with national plans for scientific and technical information.

For large units, the planning process will probably require the assistance of specialists and special machinery such as working groups, advisory committees, a planning committee, and so on. In smaller units, it is one of the normal managerial tasks of those in charge.

The planning process itself goes through several stages: definition of objectives, analysis of the present situation and available resources, assessment of the required changes, elaboration of alternative proposals and determination of the resources needed in each case, evaluation of the various proposals and recommendation of a particular plan, its adoption, implementation and subsequent regular revision and updating.

It is advisable for the objectives of the plan to be quantified. Though it is not always possible to do this with a high degree of precision, the plan should at least contain estimates that can subsequently be compared with the actual results obtained.

Organization of an information unit

The organization of the unit is not an abstract construction reflecting a purely administrative logic; neither is it settled once and for all. It is another means of helping the unit to perform its function as well as possible. It must not, of course, be constantly altered but it should be possible to make adjustments whenever necessary.

The structure of an information unit can be envisaged in accordance with the following criteria:

The functions of the documentary chain (acquisition, bibliographic description, retrospective searches, etc.).

Fields covered (for example, an agricultural documentation centre would deal with crop production, animal production, rural engineering, etc.).

Types of document (books, reports, periodicals, audio-visual documents, special collections, legal documents, regulations, patents, etc.).

In the case of a large unit, the location of each service (central service, the services attached to the various branches of the parent organization, the computer-processing department, the central repository of documents, etc.).

The clientele (for example, a development bank would have a general director's

office, a studies division, a legal service, an industrial loans division, an agricultural loans division, etc.).

Services (library, documentation centre, translation service, publications service, industrial information service, liaison service, etc.).

Naturally, these criteria can be and in practice usually are combined so as to meet user needs more effectively. At all events, it is always important to study, clarify and monitor the distribution of functions because this governs the smooth execution of operations.

Basing organization solely on the functions of the documentary chain facilitates standardization and control, and makes for greater homogeneity in the division of work, but tasks tend to be more fragmented, and it becomes more difficult to staff each section with people who are familiar with different types of document, subject and clientele. Other methods of organization result in more interesting tasks with staff members covering at least one of these different areas, but there is a greater risk of overlapping, and standardization and control are rendered more difficult.

The selected structure should minimize efforts; in other words, each operation should serve directly for as many subsequent operations as possible and everything needed for each service provided should be quick and easy to obtain. Each section

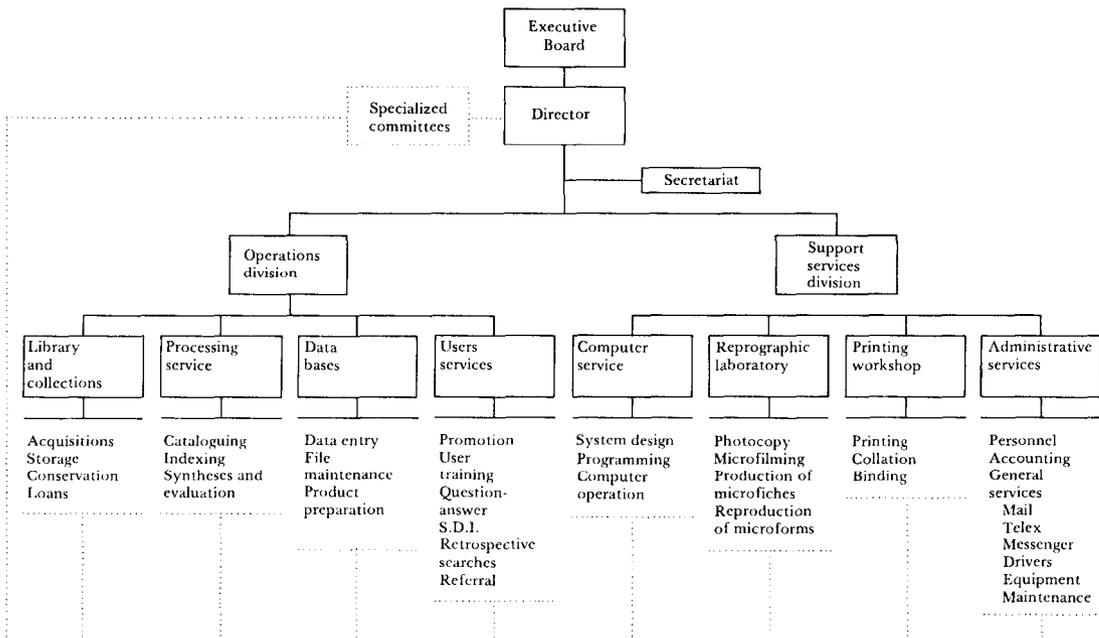


FIG. 25. Organizational chart of an information unit (a theoretical example based upon an arrangement by functions).

should be given a clearly defined role that is logical and interesting. The communication circuits should be as direct as possible and avoid pointless duplication for both staff and users.

If the unit is large (the information service of a ministry working for institutions in different places, for example), it will have to choose between centralization and decentralization. With a centralized organization, the services can be fully integrated and are simpler and cheaper to run, but the unit is often located far from its users and even runs the danger of becoming completely cut off. Decentralization presents the opposite advantages and drawbacks. In many cases a compromise is worked out in which technical operations such as cataloguing and the production of bulletins are centralized and input and output functions located close to the user.

It is useful, not to say essential, to have a sufficiently clear and detailed description of the unit's structure and mode of operation for each staff member to know where he fits in, what he has to do, and how and why. This is the point of organization charts, such as in Figure 26.

Task analysis

Task analysis and the organization of work are major concerns with a vital role in maintaining the productivity of units faced with the steadily growing mass of information.

By careful observation of all the work performed in an information unit and a detailed analysis of the processes involved, it is possible to distinguish elementary tasks, the series of tasks that make up an operation and the set of operations that comprise a function or service.

Tasks are discrete acts which cannot be broken down any further and which have a specific location in the documentary chain or administrative procedures; they effect a single transformation (for example, marking the accession number on a document or identifying the main keyword). The degree of skill required depends on the nature of the task. Tasks are differentiated according to this degree of skill, the amount of freedom left to the performer and the responsibilities implied in regard to other members of the staff.

A work unit or job is composed of a varying number of tasks. The distribution depends on the amount of work, the size of staff and the unit's organization. They should normally involve a set of closely related tasks or consecutive operations at the same level. In principle, no task should be performed by a more qualified, or less qualified, person than the work involved calls for.

Work units can be organized in accordance with the same criteria as those mentioned above for the unit as a whole. A division on purely functional lines might well prove monotonous for the staff, but this danger can be avoided by alternating duties from time to time. On the other hand, a division based on the

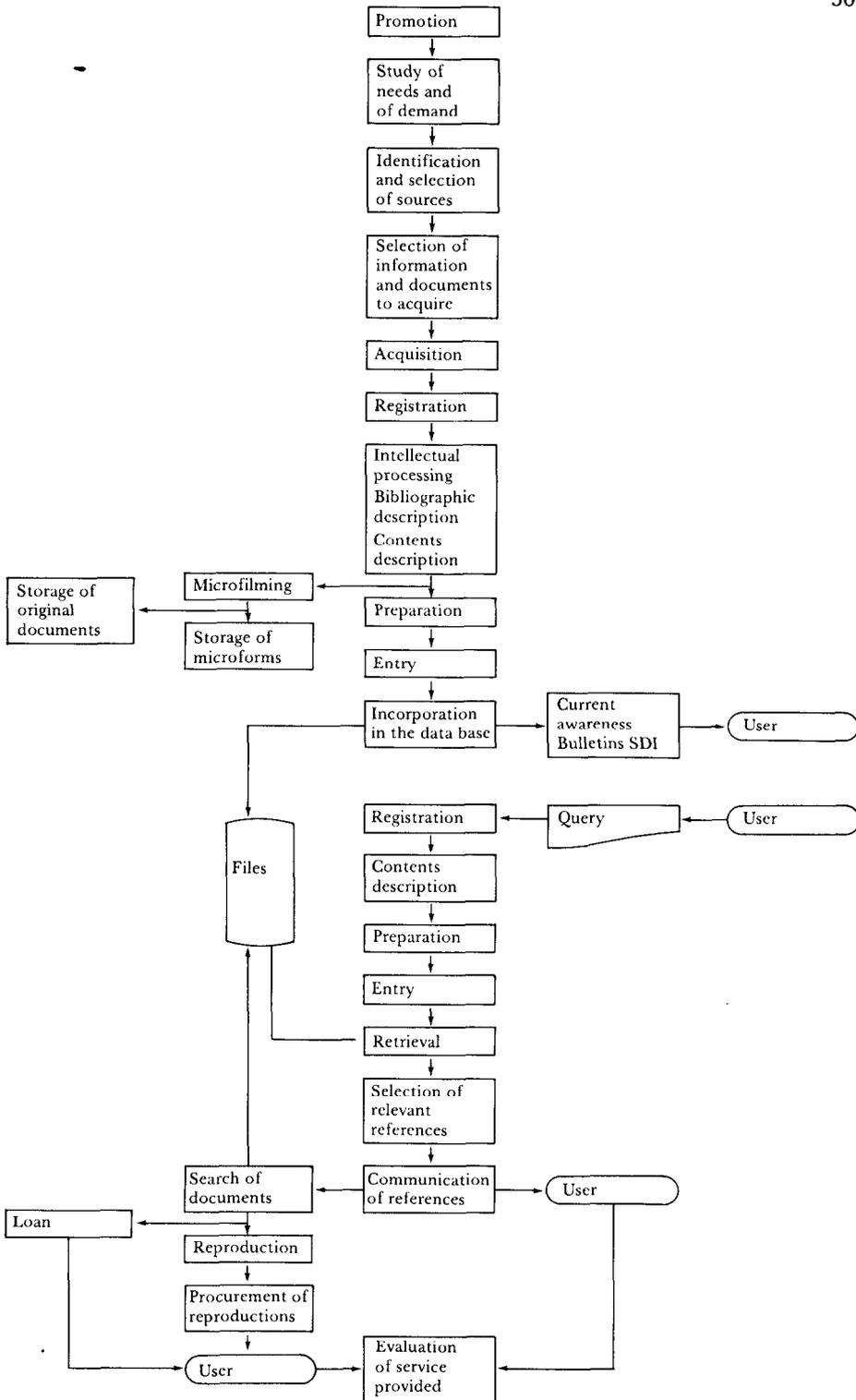


FIG. 26. Flowchart of the operations of an information unit.

type of public, product or specialist field—often preferably in combination with a functional division—sometimes tends, especially in smaller information units, to result in too many tasks performed by under-qualified staff. As all the functions of an information unit are interdependent, it is better for all the staff to be perfectly familiar with all the unit's work. This can be arranged in providing a thorough introduction for new staff and by job rotation. Since most information units have a small staff, it is advisable to be able to cope with any eventuality, to define jobs with some flexibility and ensure that all staff members are as polyvalent as possible.

Information units offer many **employment opportunities**: (a) administrative jobs (typing, bookkeeping, legal services, personnel department, etc.); (b) technical jobs (reprography, binding, computer processing, etc.); (c) specialized jobs in scientific and technical information (archives, librarianship, documentation, etc.).

These jobs can be filled at different levels of execution, supervision or management (see Chapter 24). They should be accurately described so that candidates or staff members know exactly what is involved. This 'job description' covers the hierarchical level, the responsibilities, the amount and kind of work, the qualifications required, salary and administrative status.

When information specialists have an officially recognized administrative status, the job description must mention the fact.

Personnel management is of particular importance in information; in many countries, career prospects are still all too often limited. Staff must be recruited with great care and efforts made to keep up their enthusiasm by arranging meetings, discussion groups, etc., and continuing in-service training.

The salary scale and increments should reflect the general conditions of the profession, growing responsibilities, further qualifications and improved performance. Salaries are sometimes supplemented by other payments (allowances, bonuses, etc.). It is most important that members of the staff have clear salary and career prospects.

Costing and performance evaluation is fundamental to most managerial activities. There are direct costs, which are those related to a particular documentary function (for example, the salaries paid to indexers) and indirect costs which are chargeable either to documentary functions in general (the indirect costs of the system: thesaurus maintenance, for instance) or to general overheads (the indirect costs of the organization: lighting, for instance). There are three categories of direct cost: staff costs, materials (documents, supplies) and equipment (amortization, operation and servicing). Costing calls for the analysis of transactions and the time taken. The transactions cover the quantity and cost of purchased items (for example, the number and total cost of microfiches bought in one year), intermediate products (number of documents indexed), and the products and services delivered to users (number of photocopies). The other element is the time spent on executing each task, for the measurement of which a unit of time and a nomen-

clature of the tasks involved are required (time spent on indexing a document of twenty pages, for example). The time spent implies certain labour costs and the cost of using equipment.

The costs are measured on the basis of bookkeeping vouchers and records which are analysed systematically or over a given period of time. In some cases a general estimate will suffice, but good management requires them to be broken down into cost units, that is, according to the functions stated in an accounting scheme. The accounting scheme is a double-entry matrix which shows the various types of cost for each function. The definition of functions depends on the organizational structure of the unit.

Another important aspect of performance is the time taken. This can be checked by recording the dates when documents or queries (individually or in sets) pass through each work place or function. These data can then be noted on a planning chart to facilitate analysis. Even though information work is of an intellectual nature, it is preferable to treat it like normal production activities and to make sure that capacity is being fully utilized. This is done by establishing the normal work load for each job and each piece of equipment in the form of a chart which states, for a given period, the theoretical production capacity, the expected amount of activity and the actual production. This will show where performance has been good or poor, help identify the reasons and make it possible to take advantage of success or put the matter right.

The qualitative aspect of performance evaluation is more delicate to handle. If the unit has no arrangements for monitoring each task or operation, it will have to resort to sample surveys or artificial tests. With monitoring procedures—which cannot be recommended too highly—the proportion of products rejected and the reasons why (for example, 5 per cent of indexing operations for lack of specificity) are recorded. A useful form of control, which can provide a partial and subjective indication of performance, is based on user reactions, which can and should be systematically requested. It is also possible to establish special criteria for each function, service or product and to measure performance on a regular or occasional basis. For example, the effectiveness of a question-answer service could be assessed in terms of speed, exhaustivity, precision and ease of use. These data, together with the cost structure, will provide enough information to improve this service and the unit as a whole.

Budget control integrated planning data (that is, the estimated volume of activity: the number of SDI profiles planned for the year, for example) and accounting data (the actual number profiles served, the rate of production and the cost). This will point to ways of improving the unit's mode of operation and make it easier to foresee the consequences of decisions or other factors likely to have an influence.

Unfortunately, available data on costs and performance are at present in short supply and difficult to compare. They obviously depend on the situation and organization of each unit, and on the methods of calculation, which vary consider-

ably. Disparities in the available figures are too great for the conclusions to be significant.

Budget and financing

The budget and financing of information units depend on their legal status and their type: clearly, there will be a considerable difference between a computerized national centre and the library of a small university research laboratory, but their budgets have much in common.

The main items of expenditure are as follows:

1. Staff salaries and related charges; this is the largest budget item in all units and often accounts for over half the total expenditure.
2. Purchase of documents; this is the second largest item though it occasionally—all too rarely—exceeds staff costs.
3. Expenditure on processing (use of the computer, production of bulletins, etc.).
4. Supplies.
5. Equipment (amortization, servicing and replacement).
6. Premises (only significant for large units).
7. Communications (mail, telephone, telex, transport, etc.).
8. General overheads (electricity, cleaning, etc.).
9. Expenditure on sub-contracting. This item can be quite important if certain functions (computer processing) are performed by other organizations or if certain jobs (elaboration of a thesaurus) are contracted out.

In normal circumstances, Items 4 to 9 account for only a small proportion of the total budget, two-thirds of which is devoted to 1, 2 and 3. In most cases, the unit's resources are in the form of budgetary allocations from the parent organization. The amount generally depends on needs and possibilities but there also exist certain standards and ratios for determining the desirable level of a unit's resources in relation to its clientele and the overall budget of the parent organization. Unfortunately, the actual allocation is sometimes simply what is left over after the requirements of other departments have been met. This explains the need for accurate accounting and efficient financial administration to help the unit defend its requests more effectively, and for high-quality management in general to provide a clear justification for the sums involved.

For some units, especially those which benefit from legal deposit, the various types of free acquisitions can make a significant contribution. Lastly, many units are deriving more and more resources from the sale of products and services.

It should be observed that the separate items of the budget are relatively inflexible: it is not easy to make much change in the distribution of expenditure or to increase overall resources. At the same time production costs, in particular for staff and acquisitions, are rising steadily. This obliges units to pay special

attention to management, and in particular to policy formulation and increased productivity.

The budget is prepared in conjunction with the plan and takes the financial data and results into account. It can either start with available resources, distribute them among the items of expenditure and if necessary try to make cuts or find additional resources, or it can work in the other direction. In many cases the two approaches are combined.

Payment of services: here a frequent problem is that many information units are in one way or another public services expected to function free of charge or come under the general services of their parent organization. Another difficulty with charging is the widespread view that information should be freely available to everyone, or that it is a right. This is perfectly true, but health is also a right and this does not exclude medical fees. Even where no actual charge is made, however, payment can be used as an administrative technique for the unit and its partners, since it is a simple and effective way of measuring the usefulness and utilization of services. In this case, the payments would be fictitious or returned at the end of the financial year.

When information services which have been free begin to make charges, even a very small fee will at first lead to a drop in the number of users. Even services that were free only for a trial period and whose users are perfectly aware that the time will come when they will have to pay experience this. Nevertheless, if the service proves its worth, it should quickly make up the lost ground and then find the number of users rising. The fact is that users are ready, at least those in productive activities, to pay a fair and even a high price—and often do so—for really useful information that reaches them in time and in acceptable form. Often the refusal to pay is simply a sign that the service is being rejected because of low quality or unsuitability.

Information units can charge for admission to the unit, for their various products and services (publications, SDI profiles, answers to questions, translation, etc.), for photocopies or microcopies, for postage, or to help defray the cost of meetings, visits or other activities that they organize.

Payments can take the form of dues, subscriptions or a charge for each service rendered. Regular users would have an account and pay the bill at fixed intervals.

The charges made can cover all the direct and indirect costs of each product or service, but this system is still only practised by a few commercial units, whose prices also include a profit margin. Another approach is for the charge to cover all production costs but not the initial cost of setting up and running in the system and its products. Sometimes only direct production costs or a varying proportion of them will be demanded, while other units require payment only for certain products or services, particularly those which involve extra work in addition to what they regard as normal services: for example, they might make no charge for a retrospective search but demand payment for a selective bibliography.

In each case, once the production cost is known, the price should be set bearing in mind that if it is too high it will be out of the reach of the user however much

he is interested in the product or service. The prices of similar products and services available elsewhere should also be taken into account, the aim being to make the unit's activities as profitable as possible or at least to obtain the maximum amount of income.

Promotion and market research

All information units, even those whose usefulness seems self-evident, must pay careful attention to these if they do not want to go into a gradual decline.

Market research involves an integrated set of activities whose purpose is to determine:

The potential clientele of the various products and services, together with their characteristics, needs and motivations.

The characteristics of the products: nature, content, presentation, quality, availability and possibly price.

The standing of a product in relation to other similar products (for example, the advantages of a national abstracts bulletin in relation to equivalent foreign publications).

The possibilities of a broader clientele (attracting new groups of potential users) or of consolidating the clientele (taking action to convert as many potential users as possible into actual users).

Strategies for the promotion and dissemination of the products.

In business concerns, for example, the library is often regarded as a possibly useful luxury. By studying the various categories of potential users it is possible to find out the reasons for this image, what the people would like the library to contain and how they would like to utilize it. This will suggest how the library should be laid out, how it should be run and what documents it should acquire. The next step could be to see what other libraries offer the same services and whether they have any particular advantages. An attempt would then be made to discover how many potential users could be attracted to the library and the best way of going about it, and whether the library should be opened up to outside users and, if so, how to attract them. The reorganized library would then be promoted along lines that the preceding research had indicated.

The promotion of an information unit is represented by an interrelated set of activities whose aim is:

To publicize the unit, its products and its services among potential users.

To encourage them to utilize the unit; to make its products and services attractive.

To show potential users how to make use of the various products and services and what advantages they offer.

To maintain contact with the users with a view to keeping them informed about the unit and obtaining their reactions.

A wide range of methods is used: advertisements in newspapers, leaflets given

or sent to potential users, the organization of visits to the unit, demonstrations and open days, posters, offers of products and services on a trial basis, and personal contacts with individual users and their superiors.

Though personal contact is the most effective approach, a unit will in practice often find it worth while combining several of these methods to form a promotion programme.

Efforts to promote the unit should not be restricted in time, for instance, to when the unit is created or a new product introduced, but should be kept up at a high level. The aim should be to put the dialogue with users on a permanent footing, one possibility being to organize a club or association so that users can be directly or indirectly associated in the management of the unit as actively as possible.

A natural part of promotion activities is user training, with the unit providing appropriate instruction by means of documents or theoretical and practical training sessions to show how the unit's products and services can be employed to the best advantage.

The unit's links with the parent organization often have a decisive influence on the way it is run. They can be seen from two points of view: the unit's official place in the hierarchy and organization chart of the parent organization as a whole, and its informal working relations with other departments and individuals.

For its official standing, a number of requirements have to be taken into consideration. There is the need for it to be close to the users and especially the most important ones, which explains, for instance, why information units are frequently attached to research departments; to have fairly direct and effective links with all the other departments; to be of central importance or at least highly respected, especially if the unit's task is to collect the documents produced by the organization; to offer satisfactory conditions of employment for the staff, particularly in regard to status; and to be able to count on stable resources over a long period. Clearly, there exists no ready-made solution to these problems. In practice every possible kind of approach is encountered: units attached to research and development services, to technical services, to administrative services or to general management; units regarded as less important than or as the equal of the other departments. Each organization makes its own arrangements and its decision in this respect has to take into consideration the objectives, policies and resources of the unit and the structure, policies, operation and general life of the organization. These last two aspects can make the situation appear highly satisfactory on paper but much less so in practice, for example, when the unit comes under general management and other departments are kept strictly separate from each other and jealously watch over their privileges. In many cases the unit itself has little say in the arrangements made on its behalf.

These decisions are taken either when the unit is set up, which clearly has important consequences, or in the course of a subsequent general reorganization if the unit wants its position to be changed.

The relative position of the unit in the organization's hierarchy has a pervasive

but not decisive influence on its informal relations with the other departments. Owing to the nature of its work, it functions in parallel with production and administrative activities. It has to make sure that it has links with all parts of the organization at all levels and find ways to getting round any reluctance to co-operate on the part of certain sectors or at a particular level. Through paying systematic attention to these links the unit could become the unofficial hub of the organization, a standing that could well make up for its possibly unsatisfactory position in the hierarchy.

Links with the outside: the unit can establish relations with, as the case may be, users not belonging to the parent organization, the authorities responsible for national information policy and the development of information infrastructure, other units, and the profession.

There is no problem with external users unless it is desired to give internal users special advantages. This would make it necessary to restrict the former's access (special opening times, limited borrowing privileges, certain services excluded) or to charge more (a small charge or entirely free to internal users with a varying charge for the others). Such discrimination is only worth considering if the unit is unable to extend its clientele. However, every effort should be made to associate external users with the running of the unit in the same way as internal users.

The purpose of establishing relations with the national authorities responsible for national information policy is to ensure that the unit has a recognized role in the information infrastructure, is invited to take part in policy formulation and the preparation of programmes, particularly through the working groups and commissions of the national plan, and is thus enabled to base its own policies and development on these national actions.

Links with other units can serve a number of purposes: first, to establish friendly relations that will allow the units to exchange information and back each other up; secondly, in case of need, to exchange services, perhaps under preferential conditions; and thirdly, to promote co-operation, which can range from task-sharing or a simple division of labour in the field concerned to the setting up of joint services or even a network. Whatever the arrangement, it is essential for the senior staff of units working in the same field or located in the same area to keep in close touch with one another. More often than not co-operation proves indispensable, if only to avoid pointless overlapping (for example, the purchase of rarely requested costly books which can be borrowed from another unit). Even in the absence of a national programme, information units are increasingly tending to share out tasks (in regard to acquisitions, their clientele, and the provision of joint services such as bibliographic bulletins or data bases) and to form networks involving adoption of the same techniques and methods of operation.

When it is only a matter of helping each other, the relations can be kept informal, but joint initiatives should preferably be based on a formal agreement stating the rights and duties of each party. Sometimes, however, the unit's official status rules this out, and it is also possible for the conditions on which the co-operation was based to change quite quickly. When the situation is favourable, two units can

develop very close relations without a formal agreement and thus avoid temporary legal or political obstacles. For example, two information units belonging to organizations which themselves are reluctant to co-operate could quite easily adopt the same documentation system and the same equipment and thus in actual practice work together.

It is just as essential to establish and maintain relations with the profession. Contacts through professional organizations will enable the unit to exchange technical information, join in co-operative research on methodology, and so forth. Conversely, the unit's active participation will strengthen these organizations and contribute to the general progress of the profession itself.

Evaluation of activities

This is not a theoretical and purposeless exercise but one of management's essential instruments, which should be applied to all aspects of a unit's work.

One method is to check a unit's operations and functions by regularly monitoring some of their essential aspects. The number would depend on the type of operation or function: for example, 5 per cent of the queries processed each month could be taken to ascertain whether the time needed for the answers, their precision and exhaustivity, and the procedure followed were in accordance with the standards fixed. From time to time however, particularly when a medium- or long-term plan is being prepared, it is a good idea to undertake a systematic evaluation.

There are three levels of evaluation: the evaluation of effectiveness, of the cost-effectiveness ratio and of the cost-benefit ratio. The first level attempts to assess how far the unit is meeting its objectives or, in short, how far it satisfies its users. The second attempts to determine the cheapest and most efficient way of running the unit while the third is focused on the benefits derived by users of the service or services and whether they justify the cost.

Evaluation is a form of research which states its hypotheses and objectives, defines the objects to be examined, collects the necessary data (by means of documents, observation, measurement and interviews), analyses them and draws conclusions. Each operation or function has its own special methods of evaluation, which can be adapted as necessary. It is also possible to employ advanced techniques such as models, simulation or operational research. The evaluation can be centred on some or all of the functions of an information unit, and each function calls for special evaluation techniques and criteria. The sectors with which evaluation is most often concerned are the holdings, the provision of primary documents, question-answer services, information retrieval, data bases and documentary products, catalogues, technical services, computerization, and management.

The most usual criteria include standards, costs, effort (amount and complexity of the work involved for staff and users), response time, qualitative criteria such as exhaustivity, precision, recall, novelty and relevance, and the various signs of user satisfaction.

When these studies are carried out by or for information units, they have a very specific and practical purpose: either to detect and put right any weaknesses or to help select and organize new activities, and in many cases both. Clearly, the cost of an evaluation and the effort involved must be commensurate with the advantages to be derived from its conclusions; it would hardly be reasonable to allocate resources at the expense of production itself. But this argument is no reason for the systematic refusal to undertake evaluations, which is often in reality a refusal to change. Without evaluation, any information unit is likely to take the wrong direction, lose its adaptability or become obsolete.

Check questionnaire

What is 'management'?

What are the advantages of organizing an information unit by functions?

What are the two main items of expenditure for an information unit?

What are the different levels of planning?

Is it possible to define a policy that takes only the information unit into consideration?

What is the function of a campaign to promote an information unit?

What is the purpose of evaluation?

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22 Information management and policies at national and international levels

Information is a national resource as important, in the modern world, as energy or a skilled work force. This has gradually been borne in upon all countries in recent years and has led to a variety of initiatives ranging from consultations and studies to the setting up of quite sophisticated state machinery to supervise and promote activities in scientific and technical information.

At the same time, the fact that information is an international commodity has been inciting countries to work together and co-operate more and more regularly in this field, or to take it into consideration in the other aspects of their relations.

Today, the organization circulation and use of scientific and technical information are of major and growing concern to national and international activities.

National information policy

The need for a national information policy has arisen for a number of reasons.

The first and probably the most decisive element is doubtless the fact that the sum of knowledge and data which the individuals, enterprises and public administration that make up a country cannot do without creates an overall need for information at the national level. If this is not fully satisfied, development itself may be adversely affected. The danger is particularly great for those countries, like the developing countries, who are obliged to generate new activities.

Secondly, the total cost of the necessary information and of its processing must rise, if only because more and more is needed. If there is no co-ordination of scientific and technical information activities, it will become prohibitive, and if these activities are left entirely to private initiative, only the most prosperous sectors will

benefit; they might even be tempted to use this advantage to the detriment of the other sectors.

Thirdly, public institutions have, to begin with, an important role in the production and processing of information.

Finally, as a great deal of information can only be obtained from foreign countries, this naturally has repercussions on their international relations with each other.

The problem then is to ensure that the country's information needs, or at least its priority needs, are satisfied as far as possible by utilizing available resources with maximum economy and effectiveness. This cannot be done without a collective effort in the preparation and implementation of policy decisions, joint action, compromises and the co-ordination of activities. It is naturally the state which, quite apart from its often important role in the field of information, has the task of making this effort possible.

The purpose of a national information policy is to maximize the effectiveness of the national information system, and in particular:

To work out the information needs of the different socio-professional groups.

To establish priorities in regard to these needs.

To decide how the national information system should be organized, what services should be provided and how this is to be done.

To keep a constant watch on the capacity of the national information infrastructure (i.e. all the human, material and financial resources devoted to scientific and technical information) to cover these needs.

To decide what measures are needed to enable the national information system to perform its role.

To decide how the national information system should be further developed.

These are the main guidelines, but the national information policy must also bring together as cogently and fully as possible the more specific policies dealing with all aspects of scientific and technical information, and in particular:

Development and improvement of primary publications and, more generally, of the availability of information and data.

Expansion of document holdings and collections of data, and improved access to them.

Access to foreign collections of documents and data bases.

Development of translation services.

Bibliographic control, indexing and analysis of documents produced in the country.

Development of documentation services (referral, retrospective searches, current awareness, SDI, etc.) and information services.

Co-ordination between the various information units and specialized subsystems.

Development and standardization of equipment for the processing and communication of information.

Standardization of information techniques and products.

Development of specialized manpower and training facilities.

Financing of units and the pricing of their services.

Preparation of appropriate legislation and regulations for information activities.
Promotion of services and user education.
Encouragement of research in the information sciences.
Closer co-operation with other countries and participation in international networks.

Objectives, components and structure of a national information system

All these naturally depend on the particular situation of each country, which will accordingly tend to stress one aspect rather than another. However, a few general principles can be stated.

The national information system should utilize the most appropriate techniques and resources:

To satisfy adequately and as fully as possible all the information needs of all users.

To ensure that every possible communication channel between the sources and users of information functions smoothly and is fully utilized.

To conserve and make available the documents produced in the country.

To arrange for easy access to documents produced abroad.

To see to the bibliographic control and documentary processing of documents produced in the country.

To make satisfactory arrangements for the use of foreign documentation and information services.

To ensure that the different information systems in use in the country are mutually compatible.

To ensure that the information systems that comprise the national system are compatible with and connected up to their corresponding foreign and international systems.

To provide the means for the co-ordinated, economic and effective management of the system as a whole.

These objectives can only be achieved progressively, beginning with the needs and categories of user accorded priority. To this end, the authorities of the national information system draw up a series of plans and programmes with the short-term aim of freeing more resources by strengthening and rationalizing the existing structure and eliminating duplication, and the long-term aim of modernizing and extending the system.

Strictly speaking, a national information system is comprised of:

The different groups of information producers and users.

All communication facilities (publishers of journals and documents, organizers of congresses, etc.).

All information units, whether independent or members of specialized networks.

All information systems in the strict sense (series of products and services, the techniques employed to produce them).

All personnel specialized in scientific and technical information.

All the technical equipment used in communication processes (reprographic equipment, information processing devices, telecommunication equipment, etc.).

The financial resources allocated to these activities.

Machinery for the co-ordination and direction of the foregoing components.

Clearly, national information systems are complex, wide-ranging and diversified. Their structures vary enormously from country to country, since they deal with many different processes and embrace a great variety of relationships between the individuals, groups and institutions of which they are composed.

In some systems, the elements are separate and relations between them left to chance. This results in what one might call a natural system, which is not very effective. To cut down waste, extend coverage (of needs and sources), reduce response times and costs, and supervise their operation, systems must be organized with a sense of purpose.

The institutional structure of all national information systems includes: (a) governing bodies, who formulate policies and programmes; (b) co-ordination bodies, who supervise implementation; and (c) executive bodies through which the system functions (information units for the most part).

The executive level of a national information system is composed of a series of subsystems for each branch of activity (agriculture, the various industries, the national infrastructures, transportation, etc.) and for the different functions of the documentary chain (access to primary documents, bibliographic control and so forth); in some cases, there may be other subsystems based on territorial divisions (local, regional or national subsystems).

The strictness with which they are organized and the degree of decentralization vary both within and between subsystems. As a matter of fact, most of the various possibilities are represented in present-day national information systems. There may exist, for instance, a virtually unorganized subsystem for social documentation, a decentralized information network for animal husbandry, a geographically structured network with local, regional and national branches for liaison services to small firms and a similar arrangement for interlibrary loan, while the subsystem set up for the acquisition of translations might well be very rudimentary. Though the national information systems control document-based communication circuits reasonably well, they have so far shown little interest in other means of communication, which despite their attractiveness as alternative solutions to many problems are left entirely to their own devices.

The governing bodies and institutional framework depend on the particular situation and conditions of each country and on circumstances. It would be wrong to assume, in view of the wide range of current approaches, that the choice is not really important. An ill-considered decision in this respect or too many initial concessions to a particular constraint usually end up by greatly impeding the management of the system. Whenever possible, it is better to proceed by stages and not compromise the situation from the start through an over-restrictive legal framework.

The governing bodies of a national information system have two functions: (a) decision-making (i.e. the choice of policies and programmes) and (b) the preparation of these decisions (i.e. analysis of the situation and problems and the formulation of proposals). In both cases they must be capable of involving all the parties concerned and getting them to agree with each other. Government, research, the productive sectors, institutions specialized in scientific and technical information, and users must all be properly represented. These governing bodies may have different titles, such as 'bureau', 'council', 'committee', etc.

When there are not many participants, a single body is set up, but in most cases the situation calls for a small executive committee, composed of representatives of the main types of partner, and one or more specialized or advisory committees, larger in size, which can be put in charge of a sector of activity or function. In systems incorporating pre-existing sectoral subsystems (for agriculture, industry, research, etc.), the governing bodies sometimes take the form of committees responsible for each subsystem and a national board composed of their representatives.

These governing bodies, together with the co-ordination bodies, constitute what is known as the 'focal point' of the system.

The focal point may have an independent status (such as the Office of Scientific and Technical Information) but in most cases it is attached to an existing state institution (the Prime Minister's Office, the Ministry of Planning, of Research, Education or Industry, or the National Research Council, etc.). Each solution has its advantages and disadvantages.

The co-ordinating bodies are the permanent secretariats of the governing bodies. Their size depends on the scope of the system and ranges from a few individuals to a quite large organization, though small teams are more usual.

Their immediate task is to prepare the meetings of the governing bodies and ensure continuity. But their main purpose is to see that the decisions are carried into effect, that is, they must stimulate, support and co-ordinate the functioning of the national system as a whole. This role of leadership is of capital importance.

As a rule, the permanent secretariat is either directly responsible for managing the resources allocated to the focal point for the implementation of its programmes or has a say in how they are used. Apart from direct intervention through contracts for studies or development, grants to existing institutions or the financing of new activities, the permanent secretariat can take action by issuing guidelines and standards, giving advice and above all organizing co-operation between the different components of the national system.

For this, they keep in close touch with all members of the system and in particular with the information units. Since their job is to arbitrate between units and guide their work, it is clearly undesirable for one of these units to act as permanent secretariat. Here again, relations are based on exchange, co-operation and a general awareness of their common task than on dependence or authority. Another role of the permanent secretariats is to keep in touch with the secretariats of other focal points and with the international organizations.

The executing bodies are the organizations who participate in the national

information system, information units for the most part but also universities, scientific and professional associations, publishers, government offices, the mass media and so forth.

They take part simply by pursuing their normal activities, but also by following and respecting the guidelines, by gradually implementing the rationalization measures agreed upon and by co-ordinating their efforts. They also contribute by modernizing their activities or undertaking new ones in accordance with the national system's development programmes, either with their own resources or with support from the permanent secretariat.

When work has already begun on organizing the national system into specialized subsystems (for example, a subsystem for agricultural documentation, a network for co-operative cataloguing, etc.), certain organs of these subsystems concerned with the field in question may be put in charge of execution and, to some extent, co-ordination and decision.

An organized national information system represents a higher level of integration which requires each partner to make even greater efforts—which can only be beneficial—to improve management (planning, monitoring, budget control, etc.), in other words, to introduce more rationality.

The links with the national plan for economic and social development must be very close, otherwise the national information policy and the development of the national information system will not be fully effective.

It is clearly essential for the information infrastructure to reach the minimum level of development to render real services. But beyond this immediate objective, the expansion of the national information system should be geared to supporting the overall development of the country. If, for example, priority is given to manufacturing industries based on national raw materials, the information system should be created or strengthened in this sector rather than the public libraries sector, for instance, even if the latter has already reached a promising level and notwithstanding its fundamental importance.

While the national information policy and plan must be in keeping with the overall plan for development, the latter, for its part, must take account of them both in its formulation and in the procedures employed for its preparation. In other words, those in charge of the national information system should take part in drawing up that part of the national plan for social and economic development which concerns their field and be associated with the other sectors. It is not possible, for instance, to plan the development of food production without paying attention to information resources in that sector.

The information plan, in fact, should combine these two approaches, dealing on the one hand with the structural needs of the national information system and on the other with the immediate or structural needs of the production system, exchange system and system of regulatory mechanisms.

Financial problems are even more awkward at the national level than for the individual unit. It is true, to begin with, that existing activities are already financed in a more or less satisfactory manner. Additional expenditure is primarily

connected with the focal point (meetings of the governing bodies, staff costs and overheads of the permanent secretariat, etc.) and is not very heavy in that some of the preparatory work and most participants are financed by the units. On the other hand, major studies and especially the development of the system are expensive. In the first place, the accounts of all the organizations concerned should have a budget line showing present expenditure on information; this would give a more objective view of the real extent of new outlays and show how much room for manoeuvre in fact exists. New items of expenditure often turn out to be of minor importance in relation to the total information budget. For example, if professional staff are permitted to spend 20 per cent of their time on collecting, exploiting and communicating information, this would represent, for 1,000 professional staff with an average salary of \$800 per month, \$160,000 per month.

Secondly, the more rational organization of work, elimination of duplication (for example, a publication indexed by two or three different units), and task-sharing that co-ordination of the national system makes possible would free resources—at least resources in kind—which would be far from negligible and easy to reinvest in improvements to the system.

Nevertheless, special financial arrangements will have to be made for a large proportion of the new activities. As a rule, most of the cost is borne by the information units and the subsystems concerned, with other contributions from the focal point, which receives a budgetary allocation to cover expenditures in the common interest and gives a varying amount of assistance to particular development projects, and from the users, who pay at least part of the cost of certain services.

Provided that the information policy is well judged and the system properly managed, the expenditure should be easily counterbalanced by the increased productivity, the errors avoided, the better and quicker decisions, and the continual updating of knowledge that the national information system will permit. The mere fact of not erroneously repeating one or two feasibility studies can cover the costs of the system for a year.

Participation in international activities

Participation is justified for a number of reasons.

First, it is impossible for a country to be self-sufficient in information. To benefit from international advances, it must have access to the information systems of the majority of countries.

A large number of mechanisms (international agreements, bilateral conventions, committees, associations, networks, etc.) have been set up to cope with the steady growth in these exchanges and to facilitate their organization. Countries that do not join in might well be left behind.

Secondly, the same reasons that gave rise to the national information systems have, in conjunction with the above-mentioned factor, led to the creation of

international information systems through which the participating countries enjoy easier and cheaper access to information in the areas covered and share out the work involved. Here again, any country that stands aloof will either lack information or have to repeat work that has already been done elsewhere.

Before very long, all fields of knowledge will be covered by international information systems.

Lastly, besides the need to harmonize national systems so as to facilitate direct interconnection and thus complete the range of international networks, contacts between national systems will enable them to take advantage of each other's technical or organizational achievements, to compare methods, results and designs, and in so doing to make improvements. To participate in these activities each country must provide itself with an appropriate organization at both the general level (the national system) and in each specialist field (agricultural information, industrial information, patent information, professional organizations, etc.). In particular, its delegates at international meetings or on decision-making bodies should truly represent all the parties concerned and mediate between them and the international community.

Participation in international information programmes and networks makes it possible: (a) to bring about a rapid improvement in the access to information; (b) to develop the national information system in harmony with the systems of other countries; (c) to facilitate in this way system interconnection, which will in turn provide a more comprehensive and rapid supply of information, permit task-sharing and thus reduce costs; and (d) to make sure that the particular needs and limitations of each country are taken into account in the programmes and development of international systems.

To take part in these efforts, it is not necessary for a country to possess a sophisticated information infrastructure. It can join a computerized international information network even if it uses traditional techniques and has limited resources. Its system, however, must be organized. In other words, the country concerned must have established bodies and mechanisms capable of accurately appraising the national situation, formulating policies and programmes and monitoring their execution (that is, it requires either a general focal point or a focal point for the sector concerned, and effective links between this focal point and the other international systems or agencies).

In most cases, there are three levels at which a country participates in international programmes and networks:

First, definition of the national contribution and concerted action between the national bodies concerned; this is a job for the governing body of the focal point or for a national committee if there is no focal point or if the focal point is not sufficiently representative in that particular field.

Second, co-ordination of national activities and relations with the partners handled by the permanent secretariat of the focal point or a especially designated body.

Third, the national contributions for which the organizations concerned are responsible.

In the case of international information networks, the usual approach is to appoint a national centre working in the field concerned. Its task is to process the information according to the instructions of the network and to feed it into the system (this is why it is often called an input centre), generally through an international processing centre, and to redistribute the products and services of the network at the national level.

International technical co-operation enables developing countries to compensate in part for inadequate human and material resources in scientific and technical information.

The form it takes can vary enormously with respect to duration (from a few days to several years), purpose (assistance with design, planning, the establishment of systems and staff training, or the contribution of documents, equipment, etc.), and the methods employed (donations, scholarships, consultant missions, field projects, assistance from the outside, etc.). It is offered by international organizations, bilateral co-operation agencies, international non-governmental organizations (scientific and professional groups and associations, etc.), and private bodies (foundations, specialized bodies, etc.). The procedures employed vary in complexity. In most cases, the country in need of assistance formulates a request; that is, it submits a project for which it needs a certain amount of help. After discussions with the funding agency, the project is worked out in detail, accepted and implemented. At a later stage its results are evaluated. It must be borne in mind that a great many needs are matched by comparatively limited resources and that these resources have to be shared out between all the needs and all the countries. Preference is usually given to projects likely to make a significant contribution to the development of the information system. Since this contribution depends on the care with which the project is prepared and implemented, strict planning and efficient management are required, and these in turn depend on the smoothness with which the system or at least its governing bodies function. As most assistance is fairly limited in scope, it is important to integrate it with a consistent and well supervised national programme so that the national information system as a whole can benefit to the greatest possible extent.

Check questionnaire

Should a country have a national acquisitions policy?

What are the components of a national information system?

What is the role of the permanent secretariat of the focal point of a national information system?

What are the advantages of co-ordinating the organization of a national information system?

What machinery should a country set up to obtain the maximum benefit from international co-operation in scientific and technical information?

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23 Education and training

Professional training for those engaged in information activities is just as important as in other fields. The time has passed when a little common sense was enough to improvise processing methods for the few documents handled. But, even though information units are utilizing a growing number of constantly improving techniques and machines, they rely essentially on their staff and it is on the quality of training that the efficiency of a unit's services and the personal satisfaction of its members depends.

Training opportunities

Training opportunities in information science throughout the world have naturally expanded with the growing number and improved performance of information systems.

At the beginning of the century there existed but a few specialized training institutions in a few countries. Since then:

The number of training institutions has grown considerably.

Their scope and curricula have become much more varied.

A much wider range of teaching methods and techniques are employed.

International co-operation has been organized in regard to training policy, curriculum development and new methods, the training itself and subsequent evaluation.

In particular, the demand for information specialists on the part of developing countries has led to the creation of a large number of schools and regular training courses in the majority of countries, the gradual broadening of their curricula to cover all levels from the most elementary to the most advanced, and the provision of specific courses by the most advanced countries and the international organizations.

As a result, any person, whatever his level of education and aspirations, is presented with a wide choice of opportunities for initial or refresher training, which will allow him to obtain a professional qualification in keeping with his aptitudes.

Another consequence has been a certain inevitable confusion over the various levels of education and training, the equivalence of degrees and diplomas, access to training programmes at a higher level, and the relationship between professional qualifications and status.

Before an individual makes his final decision, he must be adequately informed and his course of training must correspond closely to the job he wants to do.

Types of training

Types of training for future information specialists are as follows:

Initial training in the information sciences, at various levels.

Initial training in a particular discipline or subject field followed, or possibly preceded, by specialized training in information science.

Specialized training in the field connected with information, such as reprography or computer applications.

Ad hoc training courses in a technique or field of information, such as indexing or the use of a particular system, etc.

In-service training.

Continuing professional education.

Each of these types of training has its own methods and content and leads to a particular qualification.

Regular training courses range in level from secondary education to Ph.D. and correspond to the four generally accepted levels in the profession: para-professional, junior professional, professional and senior professional or manager (see Chapter 24). They include training courses for assistants, technicians and supporting personnel aimed at candidates from upper secondary education without a school-leaving certificate. These people are trained in a number of straightforward skills that enable them to carry out certain routine tasks (registration of acquisitions, reproduction of catalogue cards, etc.). The courses are often part-time or in the evening so that those concerned can be trained while they are working. They do not usually last more than a year and lead to the diploma of technician.

They also include university-level courses for which a secondary school-leaving certificate is required and which can be categorized as follows:

Undergraduate courses focused on information techniques in general or on a particular technique, but not assuming prior knowledge of the field concerned.

They last from one to two years and lead to a general or special diploma (for example sublibrarian or programmer).

Degree-level courses, for which previous training in a particular discipline (or sometimes, in exceptional cases, five years of professional experience) is required.

They are for future professionals, who need a sound knowledge of information methods and techniques as well as a specialist subject field enabling them to

understand the related specialized documentation. These courses cover both theory and practice and usually last two years.

Postgraduate and doctoral programmes, which qualify students in three areas: information methods and techniques, a subject field or discipline and the management and development of information systems. These courses are for training the senior professionals of scientific and technical information, some of whom may devote themselves to research and teaching. The studies lead to a postgraduate degree, a doctorate or its equivalent and last from one to two years.

At this level, generalists who have necessarily received advanced instruction in the subject fields handled by information systems can be trained in the analysis, design, evaluation and management of information systems.

Ad hoc training is designed to provide instruction in a specific task or job, usually in a definite context. Some of these courses are run by educational institutions and some by information units or other organizations. Unlike regular courses, they are organized in response to specific requests or needs, though some of them may be repeated for a number of years.

This type of training varies greatly in form and approach (courses, seminars, workshops, lectures, etc.) but the training sessions are short and no certificates are awarded. Their effectiveness depends on the organizers making a careful selection of participants so as to ensure that they have an appropriate theoretical and practical background and are of the same level.

They usually include a certain amount of theory and a high proportion of practical exercises. Many courses of this type are arranged each year, in particular by international organizations.

In-service training can take the form of an apprenticeship, i.e. instruction by the most experienced staff members or by specialists with the theoretical and especially the practical knowledge needed for performing the various tasks in an information unit. Some units supplement this with ad hoc training, thus providing a real staff training programme. In-service training is usually for newly recruited staff but can be offered to visiting trainees. It is much more effective when it is organized on formal lines, uses especially prepared teaching methods and materials and is regularly evaluated.

Continuing education is vital for a profession in which the techniques and knowledge are constantly changing and the demand and needs growing steadily.

It relies on the individual to make a sustained effort, to be ready to learn and above all to realize that today even the most resounding qualification cannot guarantee his competence and hence his future career.

It should be focused on information sciences and techniques but also on related disciplines, languages and all subjects likely to enrich the personality, knowledge and skills of the person concerned and to revitalize his special field. The easiest method is to keep abreast of developments by regularly reading specialized publications (see Chapter 24) and to take advantage of meetings with colleagues, congresses, study tours, visits to organizations and exhibitions, and so on. But this kind of

activity needs to be backed up by the more systematic courses of continuing education arranged by professional associations, firms of consultants, international organizations and educational institutions. Each person should keep an eye on these activities by reading the specialized journals and through his personal contacts. This type of training usually takes the form of short (a few days) specialized courses, which, though no certificate is awarded, may open the way to training courses at a more advanced level.

Curricula vary greatly from country to country and also depend on the specialist field, the objectives and the possibilities. Nevertheless, general courses are of two main types, one centred on traditional librarianship while the other type pays more attention to computer science, mathematics, the communication sciences (linguistics, psychology, etc.) and system management.

General training in library and documentation sciences usually covers the following main subjects: (a) human communication and user study; (b) documents and information sources: selection and acquisition; (c) processing: cataloguing, classifying, indexing; (d) secondary documents: exploitation and dissemination retrieval; (e) equipment and technology; and (f) the organization and management of an information unit.

These curricula are interdisciplinary and combine theoretical instruction with practical exercises. Much attention is paid to foreign languages, a knowledge of which is essential in documentation (for non-English-speakers, English in particular is a practical necessity even if not a formal requirement).

Types of course vary greatly as follows:

Full-time studies (from one to four years).

Part-time studies, which enable the person to study and work at the same time.

Intensive courses (usually highly specialized) lasting from a few weeks to a few months.

Short seminars.

Periods of supervised practical work in an information unit.

Evening courses (two or three times a week over one or two years).

Educational conferences.

Discussion groups, etc.

Choice of course: to avoid ending up with a qualification that is of no use to him, the student must be very careful to select a course that is geared to his needs.

His first task is to find out exactly what courses are available, both locally and abroad. He should then weigh up local vacancies for information specialists, assess his own knowledge and aptitudes, and make his choice in the light of his educational level and the type of career he wants. The important thing is to choose the right type of course and to make sure, especially if it is centred on a specific skill, that it corresponds to his future or desired tasks or job. There is then the length and cost of training to be considered. He should explore the many scholarships offered, especially in developing countries, about which he can obtain information from professional associations, international organizations and embassy cultural

services. A last and very important point is to be absolutely certain that the degree or diploma awarded falls within the legal or statutory provisions of the home country. This is particularly important for training courses in foreign countries, which have undeniable advantages but also potentially serious dangers: (a) the course might not be geared to the technical and cultural conditions prevailing in the country in which he will be working, and (b) the degree or diploma might not be recognized in his own country.

The need for initial specialization in a field distinct from scientific and technical information is a matter of opinion. For many documentary functions, and in particular those concerned with the analysis of documents and interaction with the users, both skills are needed. Today, the usual practice is to study a subject field (during initial education or practical experience) and then to supplement this knowledge with professional training in documentation techniques. However, this dual qualification is only essential for those at the level of 'professional' and above.

Specialist fields in information science

These include branches of the profession, such as libraries, archives or documentation; certain techniques or sectors of activity, such as the processing of periodicals or rare books, certain categories of user, such as children or research workers, or certain disciplines such as history, the natural sciences, etc.

Though the choice is wide, all these specialist fields share a common core, namely, the basic principles of information sciences and techniques.

Schools offer different types of specialization and have different views as to when specialization should begin. However, it is generally agreed that a broad general culture is indispensable, and at least half the student's time is devoted to this. But a specialist field is just as necessary, particularly at the start of a person's career.

Check questionnaire

- Is professional training essential to an information specialist?
- Who can obtain a qualification in scientific and technical information?
- What alternative forms can be the training of a technician in documentation take?
- What is the purpose of continuing education?
- What are the criteria for selecting one course of training rather than another?
- Must a person be a specialist in a particular field to process information in that field?
- What is ad hoc training? What is its purpose?

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24 The profession

Occupations in information

The occupations in information have grown in number and scope with time and technical progress. The situation is complicated by the fact that the terms used to describe them have been gradually introduced as new activities appeared. Traditionally, there are three main branches—archivists, librarians and documentalists—within which certain specializations, such as bibliographer or indexer, have become occupations in their own right. Generally speaking, each of these occupations has its own pattern of training and career prospects and none has resisted the natural tendency to mark itself off, extol its own virtues and vie with the others.

Today, however, people are more willing to accept that the information occupations all belong to a single profession, albeit highly diverse, for which the current term, for want of a better, is ‘information specialist’.

The profile of an information specialist naturally includes certain features peculiar to each occupation or speciality but the general type of work all information specialists do is essentially similar. They all: (a) process documents and information and must therefore master the technical skills involved; (b) serve users and hence needs a gift for and interest in human relations; and (c) need, to work effectively, an orderly and methodical turn of mind, a sense of organization, and imagination.

The profession is concerned with:

Service: an information specialist works nearly always for other people and he must realize that this can occasionally be frustrating. His most important asset is the desire to be useful, and it goes without saying that his usefulness should be appreciated and materially rewarded.

Communication and human contact: in many cases, information work is primarily a matter of team-work. But his personal relations with the users and producers of information have even more decisive influence on the effectiveness of the service. An information specialist must be capable of understanding other people, mixing socially and inspiring confidence—in short, of communicating. To communicate he must have the necessary knowledge and language skills and be able to express himself clearly and logically both orally and in writing.

Judgement : there are so many factors that influence information—and communication too—and they change so rapidly that there is never a ready-made solution or a simple rule-of-thumb for every situation. An information specialist must always be prepared to base decisions on a large number of criteria, some of which may be contradictory.

Curiosity : an interest in people, organizations, things, facts, ideas and techniques.

It is impossible to remember or pass on knowledge in which one is not interested.

Adaptability : in this profession, the techniques employed are constantly changing but so too are the knowledge that these techniques serve to disseminate and the needs that are to be satisfied. The information specialist should have a flexible and adaptable mind that is able to master the technical skills involved. His mortal enemies are the routine and resignation often hiding behind the strict and highly logical procedures needed for various duties.

Perseverance and modesty : information work is always demanding—sometimes even physically demanding—yet its immediate results are often far from impressive; besides, it is frequently the user who reaps the benefit and the praise.

A professional code, that is, a set of moral principles and a code of conduct, is a necessary guide to professional behaviour. In a few countries there exists a written code either for the profession as a whole or for some of the occupations it covers, and some information units possess their own code of conduct. Though a formal set of rules would be highly desirable, they tend to be implicitly accepted by the general consensus of the profession rather than stated in writing. Their main concern is respect for information, i.e. the moral obligation not to misuse, keep back or distort in any way, from personal interest or opinion, the information destined for users. They also guard against breach of confidence and indiscretion, since the information specialist needs to know a great deal about the users. Whether or not these rules are codified, it is usually the task of professional associations and unit managers to see that they are respected.

Entry into the profession

There are a number of ways of becoming an information specialist. More and more people enter the profession immediately after their initial training at the para-professional (one or two years of post-secondary specialization) or professional level. Their initial training may concentrate exclusively on information science or be designed to supplement the person's education in another discipline, at different levels (two, three, four or more years after the end of secondary education). It is also possible to enter the profession after a varying amount of experience in another branch of activity. Many people with a qualification in a particular subject (chemistry, engineering, medicine, management, etc.) or in a particular technique employed in information units (reprography, computer science, audio-visual media, etc.) become information specialists in this way. They undergo initial training at the appropriate level in an educational institution specializing in information science or receive in-service training in conjunction with ad hoc

courses. Lastly, some people join the profession towards the end of their careers when, for one reason or another, they are no longer able to devote themselves entirely to their original profession; their experience, their competence as specialists and sometimes their high position can be a precious asset for certain activities with which information units are concerned, but they often find it more difficult to obtain suitable training in information sciences and techniques.

Areas of specialization: in this profession, specialist skills reflect the type of information unit, the functions of the documentary chain which it covers and its subject fields; these criteria can of course be combined.

One finds archivists, librarians, documentalists, data documentalists, liaison officers, etc., sometimes with special knowledge in a particular discipline or branch of activity whose scope may be broad or narrow (e.g. a librarian or documentalist specialized in general medicine, or in cancerology), and sometimes with a particular technical skill (e.g. cataloguer, analyst-indexer, reference officer, etc.).

Other more recent areas of professional specialization are teaching and research in information science and consultancy for information systems. Lately, with the development of networks and large information systems and the creation of complex agencies to formulate information policy, a new specialist field has emerged: the planner or manager of information. It is now also possible to specialize in information systems with initial training as computer or telecommunication specialist.

These new occupations require an excellent specialist background, advanced training in information sciences, organizational ability and powers of synthesis.

In the past, the profession tended to expand by recruiting new workers at the lowest levels, raising standards, and gradually promoting the most competent. But the situation varies considerably from country to country. The fewer information specialists there are and the more complex and varied their individual positions, the more awkward it is to define levels. This said, many developing countries find themselves in one of two situations: either the profession is dominated by people from the first two levels (paraprofessional and junior professional) and is consequently limited to a much narrower range of functions and services, or it is composed largely of staff at the second and third levels (junior professional and professional), in which case the shortage of executives is particularly frustrating and leads many people to drop out. In these countries, moreover, the strong demand for professional staff in all disciplines makes it difficult to recruit them for information occupations and this greatly impedes the development of high-quality services. The fact is that a dual qualification is essential for most information work and particularly so for the management of an information unit.

Status of the profession

The status of the profession is the reflection of rules which define levels of responsibility, qualifications, career prospects, duties and rewards of each position, and the levels of training and amount of experience required.

A few countries have established such rules at the national level, for a particular branch of activity or for particular organizations. In the majority of countries, unfortunately, they are either not defined at all or only partly defined at the three levels.

A recognized professional status is very important since it clarifies the relative standing of the profession and makes it possible to attract and keep staff with the requisite qualities. Without such a formal framework, there is the risk, especially for new occupations, that each individual will be dealt with in a haphazard fashion, with a natural tendency to diminish his socio-professional standing. The danger of this is increased by the fact that the profession is too small to form a sufficiently powerful pressure group.

Tasks in information work are defined by level of complexity, the general and technical knowledge required, and their related responsibilities. There are: Fairly elementary routine or manipulative tasks, usually performed by subordinate personnel known as technicians or assistants.

Technical tasks calling for professional qualification, and in certain cases for a general one too: cataloguing, indexing, bibliographic searches, etc.

Supervision, control and organization of the various functions of the documentary chain. These tasks require a sound professional and general training together with some years' experience.

Technical tasks requiring high-level training and solid experience in the fields or disciplines concerned: e.g. analysis and extraction of information, evaluation of information, liaison with users, etc.

Overall design and management.

Teaching and research.

In small information units, there is a natural tendency for these divisions to overlap, with the result that the profession contains quite a large body of generalists who may—and should—be moderately or highly qualified in a particular field or technique.

The structure of the profession, broadly speaking, consists of four grades: Para-professional (technicians and assistants).

Junior professional.

Professional (with a dual qualification, in information sciences and techniques and/or in a discipline or specialist field).

Senior professional and manager; there may be several more or less distinct levels in this category, depending on how extensive the information infrastructure is.

Most countries have few professionals at this level, and in many cases they are in notoriously short supply.

As a career, information occupations may seem unpromising or lacking in prestige. This is partly because the situation is at present rather confused. The future is much more hopeful: information work is expanding rapidly and its usefulness to society is steadily growing in importance and recognition.

Whether the individual regards it as a step on the way to other activities or as a genuine career with promotion coming from both increased responsibilities and

the expansion of information work in general, the true image of this profession today, with its goals, methods and new techniques, is one of great promise and absorbing interest. It offers a sense of discipline, a way of working and behaving and a renewal of personal knowledge that will always be an invaluable asset.

Professional associations are voluntary bodies formed by people working in information in general or engaged in an information occupation. Associations of this kind are evidence of a profession's vitality and perform an important role. In some cases they enjoy official or de facto recognition, and a person cannot exercise the profession until he becomes a member, for which he must fulfil strict conditions as to qualifications and experience. Their general purpose is to defend and promote the profession. They provide a forum for professionals to meet, exchange ideas, share their experience and work together in committees and working groups on various aspects of the profession such as training, status, a professional code of conduct, etc.

These associations are financed by the subscriptions of their members, though some may receive grants, but they depend above all on the active participation of volunteers. Though this may occasion extra work for the professional it is an invaluable means of enriching one's personality and helping the profession. Every professional should, at one time or other in his career, regard it as his duty to do what he can to take an active part in the association which represents him and defend his interests.

Besides their working groups, professional associations publish newsletters and specialized periodicals, organize conferences and congresses, visits, short courses and programmes of continuing education, and contribute to the formulation and implementation of national and international information policy.

At the national level, there exist associations for particular information occupations (e.g. for librarians and for documentalists), associations for all the professionals of a particular organization, and others which specialize in a particular field (e.g. agricultural information, legal information, analysis and dissemination) or in a particular type of information unit (e.g. university libraries). There are similar distinctions at the international level.

Information on the profession

Information can be obtained from a great many different sources. It is important to know them since a profession that is new and concerned with a field largely dominated by technical progress calls for a sustained effort to keep up to date.

First of all there are the studies and publications of national and international associations. These contain two types of information: on the one hand, news about the profession, vacancies and requests for employment and general information and, on the other, specialized literature. Other useful sources for establishing personal contacts and keeping abreast of documentary production are higher education institutions, congresses and national and sectoral organizations.

Certain publishing houses have special series for information science (John Wiley, Scarecrow Press, Gauthier-Villars, Les Éditions d'Organisation, for example) and their catalogues should be requested.

Throughout the world, there are several hundred periodicals devoted to information science. Among the most important are: *Archivum*, *The Library Quarterly*, *The Journal of Librarianship*, *Special Libraries*, *The Journal of Documentation*, *Information Processing and Management*, *Nauchno-Tekhnicheskaya Informatsiya*, *Documentaliste*, and *Nachrichten für Dokumentation*. Two journals, the *Unesco Journal of Information Science*, *Librarianship and Archives Administration* and the *International Library Review*, pay a great deal of attention to information activities in developing countries.

Finally, certain secondary publications list and disseminate the references of specialized literature, in particular: the *Bulletin signalétique du CNRS*, Section 101; *Science de l'information—documentation*; *Information Science Abstracts*; *Library Literature*; *Referativnyi Zhurnal* Section 59; *Informatika*; *R&D in Documentation*.

The *Annual Review of Information Science and Technology*, published by the American Society for Information Science, is an indispensable tool for every information specialist.

Chêck questionnaire

- What are the traditional branches of information activities?
- What are the distinctive features of the profession of information specialist?
- State some of the essential tasks of an information specialist.
- What does the term 'professional status' cover?
- What is the purpose of a professional association of documentalists?
- State some of the sources of professional information.
- List a number of professional journals.

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25 Research in information science and technology

Research has played and continues to play an important role in the development of modern information systems and the improvement of knowledge transfer. Until the first half of this century, there were hardly any major breakthroughs, but in the last few decades the changes have been so rapid and so profound that some people speak in terms of a revolution.

For example, a computer was first used for bibliographic searches in the early 1960s; little more than twenty years later millions of references can be searched on-line from one continent to another. In fact, most of the objects and techniques encountered in the present-day world of information specialists have made their appearance or been profoundly altered in recent years and will no doubt undergo further substantial changes.

Research and technological innovation have had their most marked and decisive influence on technical equipment, with successive generations of computers, telecommunications media and new equipment for printing and reprography, and for non-printed documents. These advances have been accompanied by impressive though less spectacular achievements in information techniques, in particular information storage-and-retrieval processes and techniques for the management of collections and data bases.

In the next few years, apart from further necessary progress on the theoretical foundations of information, research will suggest improvements to the internal operation of information systems, permit a qualitative breakthrough (enabling information systems to make a direct contribution to innovation rather than simply provide an indiscriminating access to existing knowledge) and above all bring about their close interaction and integration with society.

Main areas of research

The main areas of research show considerable scope and variety:

Information needs; how information circulates and is used; individual and collective communication behaviour; man's relationship to the machines through

which he obtains information. This group of subjects is essential and, though hitherto somewhat neglected, will be of growing importance.

The structure of all kind of signs and symbols and their role in communication processes; natural and artificial languages; semantic and semiotic analysis; automatic text processing and computerized linguistics; automatic translation. This group of subjects has always had an important place and is now of central interest, particularly automatic indexing and automatic translation.

Most research, however, has so far been centred on subjects such as: classification and indexing systems; contents analysis; the use of computers to assist or take over these operations; the organization of information storage and retrieval systems; the structuring of data bases; the computerization of dissemination procedures (production of indexes, bibliographic bulletins, SDI, etc.) and of library operations; the development of networks; the management of information units and systems; and so on.

The analysis and evaluation of information procedures, qualitative and quantitative measures of performance, and the use of models.

Character recognition, speech analysis, image processing, artificial intelligence and self-adapting systems.

Legal aspects (copyright, protection of individual rights, etc.) and security of information systems, and above all the economics of information, with its various aspects; levels of analysis and social implications. This group of subjects is beginning to play an important role.

Research in the information sciences calls upon a large number of disciplines and is influenced by their own achievements: general systems theory, cybernetics, logic, computer science, sociology (particularly the sociology of science and the sociology of organizations), management, psychology, linguistics, decision theory, etc. Despite strenuous efforts to incorporate the findings of this research in formal theories, information science has so far been mainly concerned with applied research. It is in its infancy and still handicapped by its rather imprecise concepts and by the methodological difficulties arising from the complexity of its subject-matter. It will have to make progress with fundamental problems, such as the nature of information and knowledge, before it can advance to the next stage.

The potential impact of research on information systems is enormous, to judge by developments of the last few years. In about ten years' time, most aspects of information systems will probably have changed even more than they have during the last decade. Outward signs of this will be the general use of computerized procedures, the extension of computerized networks giving access to a growing volume of information of all kinds, new carriers and channels of communication, new techniques for the evaluation and control of information making it possible to cumulate knowledge rather than lists of references, and more flexible and wide-ranging possibilities for interaction between users and systems. Furthermore, the cost of processing and disseminating information should normally continue its rapid downward trend and make it possible to cope with the exponential increase in the volume of information and the need to render it accessible to everybody.

The essential functions of information units will probably not change very much in the short run. Libraries exclusively devoted to machine-readable collections with remote consultation are not for tomorrow, but they are no longer an idle dream. In any case, the methods of information units will have to be geared constantly to the new techniques and new socio-economic conditions. It is therefore important for information specialists, as it is for all other professionals, to be continually aware of new trends and developments in research. One fairly easy way is to take part in the activities of professional associations, attend as many conferences and specialized seminars as possible, and regularly read through the relevant primary and secondary literature and the directories of ongoing research, such as the FID publication *R&D in Documentation*.

Research methods

Research methods in information science reflect the variety of subjects investigated. They make wide use of mathematical and statistical tools, and of graphic techniques such as flowcharts and sociograms. Operational research and models are also employed with success, in particular for complex problems or problems concerning flow (networks, movements in the collections, etc.). Methods developed by the social sciences, such as tests, contents analysis, surveys by questionnaire and interviews, participative observation, etc., are naturally employed for the human aspects of information systems and in particular for studying information needs, users and user behaviour.

The subject-matter of information science, whether collections or data bases or individuals or groups, makes it difficult to organize practical experiments since the characteristics in each case are highly specific and not easy to deal with. They often have to be based on samples (of collections or user groups) or on artificial situations, an awkward method that can distort results. Another serious methodological problem springs from the fact that many concepts in this field still lack precision, for example, the concept of information and the value judgements (the relevance of references) underlying many observations.

The contribution of information units to research can be decisive. At its present stage of development, a major task of information science is to accumulate observations for analysis and to outline and test theories and rules.

Through efficient management and above all by making the effort to record explicitly and in detail—though without overburdening the work-load—internal transactions connected with technical operation (for example, the time taken for photocopies ordered from a lending library to arrive or the reasons why a supervisor rejects certain descriptors proposed by the indexers), and transactions with users (e.g. the channel of communication for queries), a body of data can be built up that will be valuable for its own sake as well as for research purposes.

Information units can also identify problems in respect of which research is

needed and guide the research. Units operating within a highly organized framework whose parameters are known and controlled can provide valuable opportunities for experimentation. This two-way participation of information units in research is particularly desirable in developing countries, where the study of information activities has still a long way to go. The progress of information science and technology is not in the responsibility of a few privileged specialists absorbed in their esoteric concerns, but of the entire community of information specialists and perceptive users.

Check questionnaire

Is research in the information sciences important?

What is it focused upon?

What are the present trends with respect to information systems?

How can a person keep abreast of developments in research?

Can an information unit contribute to research? How?

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