

HOW TO FIND INFORMATION

in science and technology

Second edition



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Jill Lambert
Peter A. Lambert

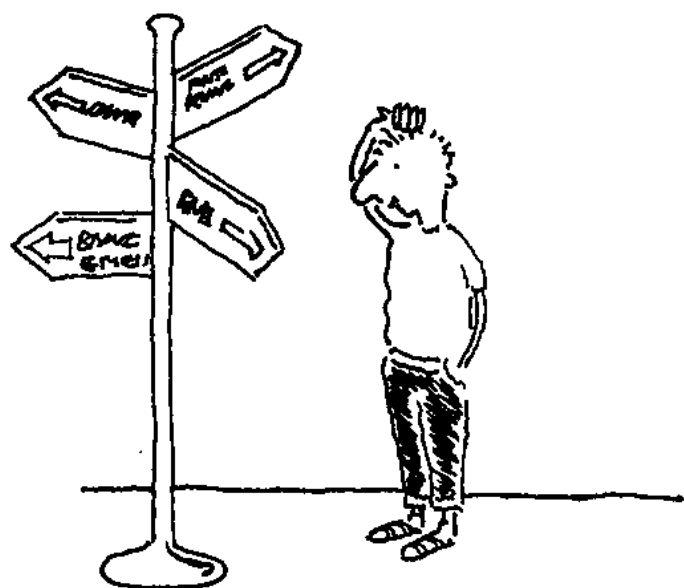
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1

How information is communicated

Our purpose in writing this book is to help the practising scientist or technologist to find information. Before we begin to outline the methods and techniques used to find information, though, we must first take one step back and consider how scientific, technical and medical information is communicated. This information, generated by a variety of organizations including industrial and commercial enterprises and academic and government institutions, reaches the outside world through several different channels. Searching for information is easier once you know what these channels are and how they interlock to form a communication system.

People

The first obvious but very important way of spreading information is by word of mouth. People talk to friends and colleagues, passing on news about their own work and often including pieces of information they have read elsewhere. Information is also spread in this way in a more organized fashion by people talking at seminars, conferences and so on.

Picking up information from friends and going to meetings is very popular, particularly in engineering. The reasons are simple enough – it is far more convenient to ask someone working in the same field than it is to search through a mass of literature, and easier to learn about new work at a meeting than to read about it in print. The snag with transferring information in this way is that it can only reach a very limited number of people. If you need to know something and your contacts cannot help, you have a problem. That is why other printed methods of communicating information, which can reach a large audience, are also needed.

Journals

New research which does not have to be kept secret for commercial or defence reasons is nearly always published in the form of articles or papers in journals. There are a large number of journals publishing research in this

way, and they range in scope from very general ones covering the whole field of science to the very specific, covering small subject specialisms. Some are published by learned societies and professional institutions such as the Royal Society of Chemistry and the Institution of Mechanical Engineers, while others are the product of commercial publishers such as Blackwells Scientific, Elsevier Science, Pergamon, Wiley-Interscience and Academic Press. Before a paper is considered worthy of publishing it has to be refereed, that is, evaluated by fellow-workers in the subject field. Refereeing practices vary between journals but generally manuscripts are evaluated by two independent assessors who are looking for originality, validity and quality.

Most of the space in these journals is taken up by full papers having a well-defined format, with an introduction in which previous work is outlined and the objective of the research project indicated. This is followed by a section outlining the experimental work conducted and any special methods used, the results, and the conclusions discussing their significance and value. Where the findings are more limited, these are sometimes published as short papers, usually four to five pages in length.

The refereeing procedures plus the time required for editing, printing and binding mean that most papers are published approximately six to nine months after their submission. Where authors want research made public very quickly, perhaps because they believe it to be particularly significant or because there are rival teams working in the same field, they can attempt to publish the work in the form of a preliminary communication or letter. Such communications tend to have fairly brief introductory and experimental sections, concentrating on the results and conclusions which can be drawn from the work. In order to reduce delays in publication, the refereeing procedure is usually abbreviated for such communications. It is assumed, however, that these will be followed later by full papers, although in practice this is by no means always the case.

Many journals publish a mixture of all three types of paper: full, short and preliminary. With the rise in popularity of preliminary communications, new journals consisting solely of this type of paper have been established. To minimize the length of time between submission and publication of a paper, many of these journals use camera-ready copy, that is, the typescript is prepared by the author, on whom the onus is placed to produce a perfect copy.

Not all journals limit themselves to publishing research papers in the form outlined. Some journals concentrate on picking out the more interesting new developments and presenting these in a readable manner. Two of the most familiar are *New Scientist* and *Scientific American*, but there are many more specialized ones, particularly within engineering. Apart from the fact that they make interesting reading, these journals can be useful because new products are widely advertised in them.

Theses

Much of the research published in journals is carried out by students working for higher degrees. This work has to be written up in the form of a thesis or dissertation, so that it can be assessed by external examiners. Theses can be good sources of information because the first chapter is always a state-of-the-art review of the subject, backed up by a comprehensive list of references to previous work.

Conference proceedings

Very often the research reported at conferences is later published as proceedings: sometimes in the form of a book, sometimes as separate papers in a journal. Conference proceedings can be a useful way of finding out about projects still in progress which have not been written up in complete form as papers in journals. Conferences tend to focus on expanding subject fields or themes which are becoming increasingly important, so the published proceedings often reflect the future direction of a speciality.

One note of caution here – published proceedings, at least those published in book form, are not refereed as are papers published in journals. The data may not therefore have been subjected to the same critical scrutiny.

Reports

A significant proportion of applied research and development is first written up in the form of reports. Some reports are made openly available to anyone interested but where the work is of commercial or military value they are restricted to a strictly specified limited number of people.

When reading reports it is worth remembering, as with conference proceedings, that the information has not been externally evaluated or refereed. Much of the information which first appears in reports is in fact later published in journals, but in condensed versions. If you have a paper in which reference is made to an earlier report on the topic, it could be worth getting hold of this because of the extra detail included.

Patents

Industrial research and development which has some commercial value is normally published as patents. These are documents granted by governments to the owners of an invention, allowing them a monopoly for a limited period of time in order to exploit the invention. In return for this monopoly, the owners have to disclose, that is, make public, all the information available about the invention. Obtaining a patent is quite a lengthy and complicated affair since the invention has to be examined by a government's patent office. In the UK the first information about a patent application is generally published about 18 months after submission. The patent application is then formally examined and if accepted is republished as a complete specification

two years later.

Despite the large numbers of patents in existence – approximately 2,000,000 British patents were published between 1917 and 1990, for instance – it must be acknowledged that they are not especially popular information sources for scientists or technologists. Problems are experienced with the legal style, and there are complaints about inadequate descriptions and implausible claims. There does seem to be a general belief that the information will later appear as papers in journals or conference proceedings. Certainly some information is later incorporated into promotional or trade literature, but that apart, very little is republished elsewhere. Although there may be difficulties in extracting the information contained in patents, to ignore their existence completely is unwise.

Trade literature

Trade literature – advertisements, catalogues and company magazines – is a well-used source of information, particularly in engineering and construction. It contains the kind of practical information not published in more conventional literature, and also has the plus point of (normally) being well presented and illustrated.

Standards

Most of the publications we have outlined so far are used to spread information about new research and development. Standards are different: they do not communicate new facts but specify acceptable dimensions in a product or set acceptable levels of quality or codify good existing practices. The most familiar, at least in the UK, are those produced by the British Standards Institution, but there are many other organizations, worldwide, which are also involved in formulating standards.

Books

The most familiar of all the printed methods of spreading information is, of course, books. Books do not report directly on new research or development: their publication schedule would be too slow and the information content of the average research paper would be too specialized to be of interest to sufficient readers to make a book economically viable.

What the author of a book does is to repackage and evaluate information which has already appeared in a lot of different publications, which makes the book very useful when you need an introduction to an unfamiliar topic or to check a fact.

Reviews

Another way of drawing together information appearing in journals, conference proceedings and so on is by means of a review: a critical

evaluation of the developments which have taken place in a speciality. Reviews are very highly regarded as information sources by scientists and technologists because they are written by acknowledged experts, and are well provided with references to further readings.

Reviews can be found singly in all sorts of publications – journals, conference proceedings and so on – and also collected together in separate review serials. These usually have easily recognizable titles such as *Annual review in . . .*, *Advances in . . .* and *Progress in . . .*

Abstracts, indexes and databases

All these different channels of communication are potential sources of information. The problem is how to find what you want among the mass of irrelevant items. One method of looking for information on a topic would be to look at as many relevant journals as you could find; another method might be to browse through any conference proceedings available. Searching in this way is not very systematic though; it can take a long time and the result will depend very much on what material is actually on the shelves in your library or information centre.

A much more efficient, effective way is to use abstracts or indexes. These are publications listing papers appearing in many different journals. Many also include conference proceedings, and some include reports and patents. There are many of these abstracts and indexes in science and technology – virtually every subject field is covered by one or more of them – and they are produced in the form of journals, coming out at weekly, fortnightly or longer intervals throughout the year. Most are now also produced in electronic form, searchable by computers. In this form they are usually known as databases or databanks. As Figure 1 shows, they play a major role in the network by which scientific and technical information is communicated.

References

Before outlining the practical methods you can use to find information, it is worth briefly mentioning how work is cited, that is, referred to or acknowledged in publications.

There are two different ways of citing references.

1 The numeric system, in which each publication referred to is given a separate number; for example, 'Further work (9) has shown' or 'Further work by Jones (9) has shown'. The numbers can also be given as superscripts. The references are then listed in full in numerical order at the end of the publication.

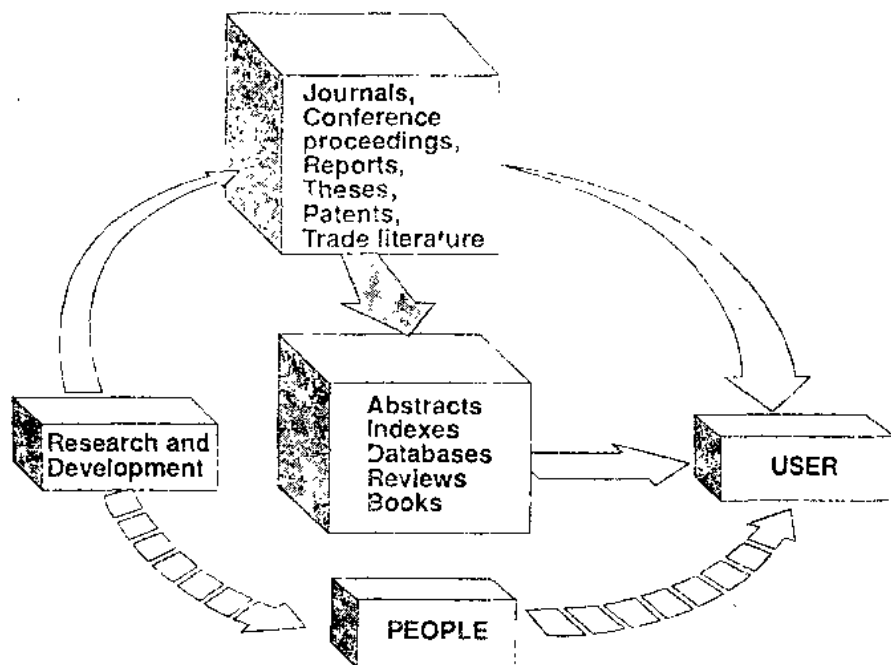


Fig. 1 Communication of scientific and technical information

2 The Harvard system, in which each time a publication is referred to the author's name and year of publication are given; for example, 'Further work (Jones 1990) has shown' or 'Further work by Jones (1990) has shown'. If there are two authors, both names are included. Where there are more than two authors, only the first name is quoted, followed by '*et al.*'. The references are listed in full in alphabetical order of author's names at the end of the publication.

There is no one standard way of setting out a reference: practices vary between publishers. This does not matter too much as long as sufficient information is included about each publication to allow it to be identified uniquely and traced.

Books

References should include the author, title, publisher, year of publication and preferably the town or city of publication, as below:

BRAITHWAITE, N. and WEAVER, G., *Electronic materials*, Sevenoaks, Butterworth, 1990.

Where an author has contributed to a book which has been edited by a different author, details of both contributor and editor are included; for example:

SHARKEY, J., 'Building blocks of a fourth-generation system', in HOLLOWAY, S. (ed.). *Fourth generation systems*, London, Chapman and Hall, 1990, pp. 57-73.

Reports and theses are also referred to in a similar way. Usually reports are given code letters and numbers – such as ST1/DOC/10/246 – which should be included in the reference. References to theses should state the type of degree, such as MSc or PhD, and the institution where the work was carried out.

Journals

Because there are so many journals, each issue of which can contain a large number of papers, it is necessary to have a system by which each paper can be referred to precisely. This means including not only the author and title of the paper but also the name of the journal and details of which part or issue it appeared in, as in the reference below:

WATSON, J. D. and CRICK, F. H. C., 'A structure for deoxyribose nucleic acid', *Nature*, **171** (4356), 1953, 737-8.

The volume number (the number given to all the separate issues published in any one year) usually appears in either italic or bold print. Titles of journals are printed in italic to distinguish them from the titles of papers. Journal titles are very frequently abbreviated, but unfortunately the recommended standard abbreviations are not always used.

If you are in doubt as to what an abbreviation stands for, it is better not to guess: a lot of time has been wasted chasing inaccurate references in this way. Abbreviations can be checked in several books, a recommended one being A. Alkire's *Periodical title abbreviations*, 7th edition, Detroit, Michigan, Gale Research, 1989.

Conference proceedings

References to papers published in conference proceedings tend to be fairly long. To avoid confusing two conferences with similar names, it is important to include the number of the conference (if there is one) and the name and place it was held at, as shown below:

WALTON, A. D., 'Jaguar's approach to the introduction of CIM', in *Computer integrated manufacturing: proceedings of the 4th CIM conference*, Madrid, 18-20 May 1988. Bedford, IFS Publications, 1988, pp. 85-98.

Patents

Every patent published is given a separate number, which should be included in the reference; for example:

ROLLS-ROYCE PLC, *Gas turbine engine tip clearance sensor systems*, GB patent application 2229004A, 1990.

Standards

Standards are also published bearing individual numbers and codes, which should also be included in the reference; for example:

BRITISH STANDARDS INSTITUTION, *Code of practice for fire precautions in the chemical and allied industries*, 1990, BS 5908.