

C D Knee

Scientific knowledge has grown to such an extent that personnel must specialise in order to be competent. To gain access to the knowledge of others, specialist information stores, that is, libraries, documentation centres, archives and data banks, have been developed. The function and role of such stores are examined, and the cost and time savings involved in the use of secondary information sources and services outlined. Dependence on exogenous sources should be avoided by the development of indigenous information systems and technological capability.

We can probably trace the growth of the information component in science and technology, which has become so evident in recent years, to the economist Adam Smith writing his book "The Wealth of Nations" in 1776. It is said that Smith, observing practices in a pin making factory, found that if manufacturing operations were split between workers so that each developed skills in a specific area, the output of the unit as a whole increased. And so developed the concept of division of labour, until today we find that not only have the majority of people, including scientists, become highly specialised, but that the volume of total scientific knowledge has grown to such an extent that no one person could possibly be competent in more than one or two fields anyway.

However, it is rare that a development project is so specialised. Guyana is developing its hydropower potential in the Upper Mazaruni area, and the project calls on skills in geology, engineering, forestry, fisheries, anthropology, etc. Thus the need for communication among scientists, and between scientists and administrators, decision-makers and the public is vitally important.

Even for the scientist to keep himself abreast of advances in his own field, unless it is excessively specialised, is a time consuming and inefficient business. Because of this there has arisen a demand for specialised information services and specialised information personnel.

The traditional store of information is the library. Here reference material and the results of past work are stored. It is in the library that the research worker will discover the state of his art, a necessary starting point for any further work. An enquirer with a particular bibliographic reference approaching a well organised library, will soon know, through the catalogue, whether or not that particular book is held, and in some cases, if not, where he will be able to find it. However, the library will rarely approach the user to encourage him to use information sources, it is more frequently left to the potential user to take the initiative and seek information. Unfortunately, it is often found that the potential user and beneficiary of scientific information is not always aware of its value, and may well take decisions or start a research project based on insufficient information. After all, is it not more attractive to many to carry out research on, for example, the use of mangrove bark for tanning, than to read somebody else's work on the same subject. This is not to say that further work on the same topic in the light of changed environmental conditions should not take place, but that the worker should be as far as possible aware of work done in the same field and take cognizance of it.

A second characteristic of the library information system is that there is very little, if any, processing of the information contained in the store. That is, a particular book or article will be classified and catalogued, and any enquirer in that field will be referred to the book, but no attempt is made to abstract the information contained therein, or to provide more than two or three access points in the system. Because of this fact, I wish to temporarily rename the library a "bibliographic storage and retrieval system" in an attempt to clarify some of the confusion that often surrounds the terms "library", "documentation centre", "data bank", etc. That is, the library system is geared primarily to the retrieval of specific documents, and to comparatively broad subject areas, rather than to the retrieval of specific information in response to a specific request.

It is the documentation centre which aims to carry out this latter function. Therefore, I wish again temporarily to rename the documentation centre an "information storage and retrieval system". Clearly, the average university or public library could not attempt to provide eight or ten access points to each document it holds, nor to abstract the information contained in these. Because a documentation centre aims to do just this, in an attempt to give specific answers to specific requests, it follows that its coverage must be curtailed and more specialised. Because of this specialised nature, the documentation centre, or information storage and retrieval system, will not serve a wide cross section of users. Its role is less the development of cultural and educational standards, as is generally the case in libraries, but more the support of professional work. A documentation centre may serve an industry or even one large organisation. As an example, the National Science Research Council of Guyana is currently creating a Documentation Centre for local agricultural research to draw together and make available information produced by various agencies in this field.

An even more specialised service is provided by the data bank, or following our nomenclature, a "data storage and retrieval system". In both a library and a documentation centre, the user is provided with access to information, although at different levels, whereas in the data bank the enquirer is presented with information for direct use. The information is broken down so that no further processing is generally required. Again, such a service is a support to professional workers, and its cultural and educational contribution, which figured so prominently in the library, is negligible.

As an example, the Ministry of Agriculture in Jamaica has established a Data Bank and Evaluation Division. The object of this unit, as I understand it, is to evaluate the various agricultural projects and programmes of this island. One of its four branches is the Data Collection and Statistics Branch, responsible for carrying out sample surveys, collecting data from the island's various Parishes, analysing data and producing indices and tables. Such information is vital to the evaluation of projects and programmes. The need for primary data for planning purposes is undeniable, but unfortunately this need is not always given full attention. A unit such as the one outlined above should go a long way to satisfy the need.

A word finally about archives. The archives may be defined as a collection of documents which because of their economical, historical, administrative, legal or cultural importance have been selected for permanent preservation. Here the emphasis is on a preservation. Although the archives have a function as a provider of information, which will be enhanced in the absence of more specialised services, the function of preservation should come first. The archives role, therefore, is not so much as a support to professional work, as in the case of documentation centres and data banks, but more in the cultural field. The national archives are, or should be, the collective memory of the nation - the unit which traces the nation's progress, its failures and its achievements.

To summarise the functions and roles of the types of information services, we may consult the following diagram, where a cross indicates primary importance, and a circle denotes secondary importance.

	Archives	Library	Documentation Centre	Data Bank
<u>FUNCTION</u>				
Preservation	x	0	0	0
Access	0	x	x	0
Communication	0	0	0	0
Use	0	0	0	x
<u>ROLE</u>				
Culture	x	x	0	-
Education	0	x	0	0
Support of professional work	0	0	x	x

The above four types of specialist units will comprise the components of a science and technology information system. Just how these components are linked to create the National System is problematic and will be considered at a later stage by other speakers.

The volume of world literature has grown to such an extent that even a specific request will generate more information than is generally required to solve the problem at hand. To scan this information and select that which is most relevant and important is time consuming. To overcome this problem, there have been created various secondary information sources and services. By secondary is meant the transformation of the primary or original documents, into a form more easily and quickly assimilated. Such secondary forms are indexes, abstracts and bibliographies.

An index of publications will list documents and provide a number of access points to each reference, through an alphabetical list of descriptors and authors. Such references, although giving full bibliographic descriptions, may or may not be accompanied by abstracts. An abstract is essentially a condensation of a primary document. An informative abstract attempts to summarise the information contained in the original and is commonly used in connection with relatively short articles, such as are found in scientific journals. An indicative abstract, on the other hand, is commonly used for more voluminous works where a factual abstract is not practical, and aims to give an indication of the content only. In the first case the abstract may provide the user information required, whilst in both cases the reader will know whether or not the original is relevant.

The third secondary form which was mentioned is the bibliography. This is a list of documents on a particular topic, by a particular author, from a particular country, etc., giving sufficient details for retrieval from a library. A bibliography will give the user an idea of the volume of literature available, plus an idea of coverage from the titles. However, the information contained within the article cannot be assessed as it can with an abstract.

Secondary services, that is the dissemination of information in above forms, are provided by several specialist documentation centres. Abstract journals and indexes are generally current awareness services. That is, they summarise information that is currently being generated in a particular field, from which the user may be informed and may select particular articles of interest. The same agencies will also provide retrospective searches on a particular topic from past current awareness publications, create specialist bibliographies and may possibly supply copies of the original. A second service which we may identify is SDI or Selective Dissemination of Information. Such a service will have what are known as user profiles for its clients which describe the field of interest of the user, and the exact type and form of information which that client requires. Any information which fulfills the requirements of the profile are then sent to the client in either a primary or secondary form.

The advantages of secondary sources and services are those of time and expense. Time is saved because the user is saved the time of scanning journals and monographs to inform himself of work that has gone on in the past and work that is currently being undertaken, as well as, in some cases, the time of extracting information from the primary document. Expense is saved, not only by time saving, but also by the fact that the secondary services are relatively inexpensive in relation to the documents they represent. It is also cheaper to translate an abstract rather than the full article, which may not be actually required. A library can no longer hope to cover world literature in a particular subject. The optimal strategy for library development, therefore, would seem to be a collection of basic texts on the subject concerned, backed up by abstract journals and other current awareness services, and a vigorous follow-up action in order to best satisfy user requirements.

Implicit in the above recommendation that libraries and individual users of information should utilise secondary sources and services, is the assumption that a nation can be self-sufficient in scientific and technological information. We realise, of course that the information generated in a particular country has, or ought to have, greater relevance to development than information generated outside the country. Indeed, no amount of information on management techniques and on technology from abroad can make up for the lack of local data: population figures, agricultural production, directories of organisations, etc.

The National Science Council of Canada estimates that 98% of the world's scientific and technological activity is carried on outside that country. With a 1975-76 budget of C\$193,201,000 it requires little thought to conclude that the contribution of Caribbean territories individually, and possibly collectively, to world scientific activity is less than 2%.

Therefore, although local information is of paramount importance and efforts should be made to organise, make available and exploit this, we cannot depend on it alone. We have already seen that to cover world literature in primary form in just one sector of the economy is virtually a financial impossibility. Only nations with a vast demand for the literature could possibly afford it. Such a situation is not the case in most countries. The only solution would seem to be to combine the many scattered users in order to create sufficient demand to reduce the per bit cost of information to an economical level; that is, to create an international system.

However, care should be taken in creating such systems that the current technological dependence of the majority of the world's nations is not merely transformed into an information dependence. With the advent of ERTS - the Earth Resource Technology Satellite, such a possibility is not too remote. At the same time as creating a mechanism for problem solving through the experience of industrialised countries, the capacity for indigenous problem solving must be developed.

It is not the function of this presentation to deal with international information systems but a few comments are in order. Firstly, the internal organisation of the nation's information production is necessary before participation in an international system is possible. One agency must be responsible for making the national input, and must be aware of all local publications in the field in question. For Guyana to make an input into AGRIS - the international information system for the agricultural sciences and technology - all agencies involved in research in agriculture, forestry and fisheries must notify the national input centre of all its publications. Of course, such an input centre would serve the dual function of serving local workers with local information.

Secondly, an international system depends for its effectiveness on the quantity and quality of the local input. Although training courses are available for technicians, the scope for miscataloguing or for differing interpretation of subject matter is great, thereby lessening the accuracy and effectiveness of the final product.

Therefore, unless the information available in international systems is to be predominantly from the wealthy nations, with the resultant dangers of dependency, the Third World must improve their internal information channels so that individual countries will become aware of technological alternatives. One nation which has realised this fact is India, and there is currently no difficulty in acquiring information on Indian technology.

To round off this introduction to information systems, I would stress the need for information as a factor of production, to rank alongside the traditional factors of land, labour and capital. Once one moves out of subsistence agriculture, for example, one requires information on the sources, price and cost-effectiveness of inputs; on optimal production techniques and information on marketing of the produce. I would make a plea for scientists to realise the value of this production factor and create a demand for it. I would encourage those responsible for the dissemination of information to actively market their commodity and ask the powers that be to give us the resources and tools to create national information systems to further national development and independence.