

# COMPUTERIZING INFORMATION SERVICES IN IRAQ

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There are several ways to computerize information services. The simplest one is to delegate the services to an information broker who has access to computer-based information sources. Another alternative is to provide facilities for the library to have remote but direct (i.e. non-mediated) access to centralized or cooperative automated library systems and on-line information service vendors. Yet another way is to implement databases from imported and/or indigenously created records on a locally available computer. The choice of option depends on the volume of demand for information, on the qualifications of the local library/information personnel and on the financial constraints.

The Iraqi Scientific Documentation Centre has been providing manual information services to several hundred researchers, scientists, practitioners and graduate students for more than a decade. In 1983/84, in the framework of a long-range plan to promote science and technology, the Iraqi Government granted the necessary funds to establish a large computer at the Centre which was also made responsible for computer services, not only for library and information work, but also for wide-ranging scientific and administrative applications.

All these conditions made it viable to establish a local computerized information service. In the initial phase it was decided to implement two bibliographic databases to provide a literature search service and a catalogue database to provide flexible and easy access to information about locally available books and serial publications. In addition, connection was established with the largest international vendor of databases, DIALOG, to complement the local services.

## THE BACKGROUND

Iraq — or Mesopotamia, as it was known in ancient times — was the cradle of culture, science and technology. Medicine, astronomy, mathematics, geometry — to name but a few — all originated in Mesopotamia, so research has a history spanning over 4,000 years.

In the past fifteen years very considerable progress has been made in agriculture, industry, education, transportation, urbanization — all supported by the

applied research and development activities of Iraqi scientists and researchers.

To coordinate these activities, the Scientific Research Council (SRC) of Iraq was established in 1963. It is responsible for activating and coordinating basic and applied scientific research in such fields as industry, health, agriculture and energy, as well as any other research and development activity that serves the realization of the national development plans. There are seven research centres within the Council, dealing with research in respect of astronomy and space, agriculture and water resources, the life sciences, building, electronics and computers, petroleum and solar energy.

Recognizing the importance of scientific and technical information for research work, the Council created a Scientific Documentation Centre (SDC) in 1972 to serve the needs of individual researchers and research institutes both inside and outside the Council. The Centre has been developing its infrastructure and traditional activities continuously since its creation and now deserves to be considered as the core organization in establishing a national scientific and technological information network.

Along with these developments it was also realized that library and information services — the essential bases for effective research and development work — must also be modernized. And this meant — among other things — computerization.

The decision to establish a computerized information service was taken not only on the grounds of cost-effectiveness, but also having in mind the long-term policy of establishing a locally developed and operated scientific and technical information network. The clientele of the information services is to be gradually broadened by serving researchers outside of the Council and by including the holdings of other cooperating libraries. This will also ensure the reduction of the service costs by spreading the one-time expenses among more and more users.

The information storage and retrieval program CDS/ISIS (1) developed at Unesco was selected as the basic applications software. This is a very versatile and powerful package used by many libraries and information centres throughout the world to automate library and information functions.

The underlying hardware was a large IBM 4341 system installed in early 1984.

## Computerizing information services in Iraq

Rather than commissioning individual experts to advise on these developments, the Scientific Research Council made a subcontract — via Unesco — with the Hungarian Computer Applications and Service Company (Számítástechnikai Alkalmazási Vállalat: SzAMALK) for the design and implementation of the computerized system. SzAMALK had already implemented several applications based on CDS/ISIS and had also had extensive cooperation with developing countries in the training of computer professionals. This made the partnership even more attractive as the Centre wanted its staff to be trained in programming and attached special importance to the transfer of the appropriate technical knowledge to its staff through their maximum involvement in the job, to prepare them for maintaining the system and for developing its applications further in the future.

### SYSTEM OVERVIEW AND DESIGN CONCEPTS

The major requirements in planning the system were as follows:

- computerized information services must be introduced at the earliest possible time for the user community most in need of bibliographic information
- powerful, rapid and flexible access must be provided to the documents stored in the libraries of the various Research Centres
- knowledge of systems analysis and programming in relation to the computerization of library/information work must be transferred to the local counterpart staff.

The major planning constraints were

- the inability of the application program and the printer to handle Arabic script;
- the lack of standards, classification schedules, cataloguing rules and authority lists for use in cataloguing, abstracting and indexing Iraqi research reports and dissertations;
- the inadequate number of library staff available for active participation in the demanding tasks of retrospective cataloguing and the provision of information services.

Consideration of these requirements and constraints, a study of the report and recommendations of a previous Unesco consultant (2), discussions with top managers of the Council and interviews both with representatives of the research centres and with librarians and information specialists, made it clear that priority should be given, in implementing the system, to

- compiling subject bibliographies;
- providing current awareness services, including selective dissemination of information (SDI) services;

- providing on-line access to a union catalogue of foreign books and periodicals;
- the production of a printed version of the union catalogue with frequent updates, multiple access points, indexes and cross-references.

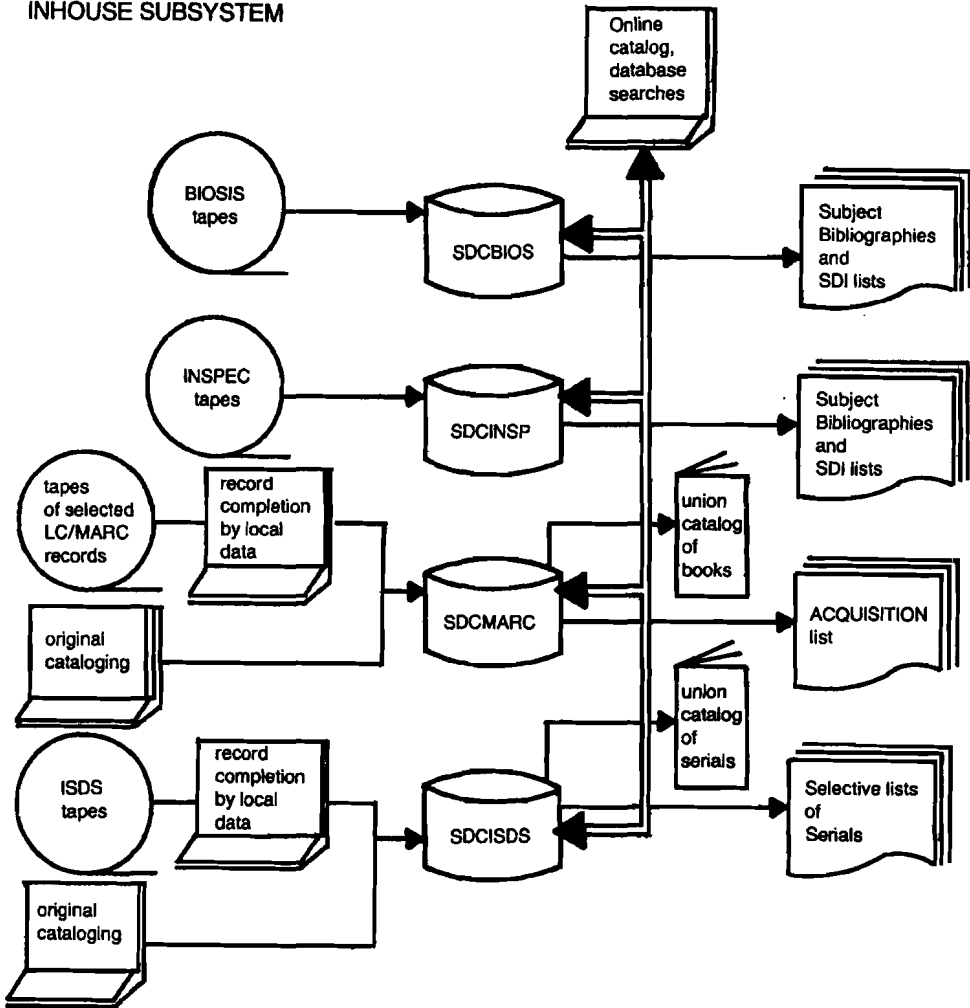
The research staff to be served by the system all had an excellent command of English. British and American abstracting and indexing journals had been used for a long time, and catalogue cards had been supplied by an American firm for some years. It was therefore decided to use the machine-readable equivalents of these sources as the basis for the new system. At a later stage, when the local staff had gained enough experience, an indigenous database of bibliographic records relating to Iraqi research reports and dissertations would be created.

As an essential preparation for the compilation of subject bibliographies and the provision of SDI services, it had to be decided which foreign abstracting/indexing tape(s) should be licensed for local processing. A check of the numerous bibliographies produced by the SDC in previous years, indicated that the BIOSIS and INSPEC databases could provide the most comprehensive subject coverage to meet the information requests of researchers, at least in the beginning.

BIOSIS (BioSciences Information Service) is the largest bibliographic database in the life sciences. It includes a very wide range of subjects from agronomy to veterinary sciences, from biochemistry to virology, from ecology to pharmaceutical botany, and from animal production to tissue culture, to name but a few which are key research areas at the Scientific Research Council. This comprehensive scope and the high quality of the database in terms of source coverage, indexing, subject classification and documentation justified the selection of BIOSIS. In particular cases a minor but very specific database such as COFFEELINE (the database of the International Coffee Organization, London, England) and TELEGEN (the abstracting service in biotechnology provided by the Environmental Information Center Inc., New York, USA) may yield more relevant citations than BIOSIS for a given search request, but on the basis of ongoing research projects and past information requests, it was BIOSIS which was deemed to provide most information for most users.

As for the applied sciences and technology, the database of the Institute of Electrical Engineers, INSPEC (Information Services for the Physics and Engineering Community), was selected as providing excellent subject coverage for physics, electronic and control engineering, computer and information science and technology. Again, one may argue that a subject-specific database like the Aerospace Database may yield more relevant citations than INSPEC for that subject, but INSPEC can satisfy the information needs of most engineers, physicists, etc.

INHOUSE SUBSYSTEM



EXTERNAL SUBSYSTEM

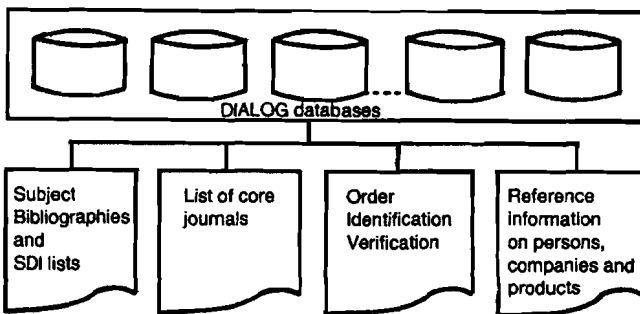


Figure 1. The computerized library and information system of SDC (Databases, inputs and outputs)

## Computerizing information services in Iraq

It was estimated that these two databases were able to meet 60 percent of incoming bibliographic information requests. In cases where the locally-mounted databases could not provide an adequate service, the subject specific ones could be searched via DIALOG.

To cater for the specific needs of the Solar Energy Research Centre, the Building Research Centre and the Petroleum Research Centre, two more bibliographic databases will be implemented in the future, namely, COMPENDEX (Computerized Engineering Index), primarily for mechanical and civil engineering subjects, and ENERGYLINE for the scientific, technical, socio-economic and policy aspects of energy.

As regards databases for cataloguing purposes, it was decided to use commercially available machine-readable catalogue records to create a separate monograph and periodicals catalogue, with the maximum compatibility between the two in terms of record structure and tagging conventions. (There are separate groups of staff dealing with monographs and serials respectively). It was estimated that for 75-80 percent of the collections in which British and American titles predominated, machine-readable records would be readily available from the Catalog Card Corporation, the SDC's catalogue card supplier, and from the International Serials Data System (ISDS) respectively. It was also decided that local cataloguing data would be added to the imported catalogue records both at the local level within Iraq and, at the national level, by the SDC, to ensure high quality and consistent cataloguing. Based on these premises, a feasibility study was prepared for the implementation of the cataloguing system, including manpower requirements and project scheduling. (3)

Components of the initial system, their inputs and outputs are outlined in Figure 1. It should be noted that the in-house system is complemented by an external system based on accessing more than 200 databases offered by DIALOG. Obviously, in the case of this external system, no programming work was involved, but extensive training in managing and operating the DIALOG-based services, including the efficient use of the DIALOG command language, search strategy formulation, user interviewing, actual searching and service administration, was provided.

### IMPLEMENTATION

The computerization project was given the highest priority among the activities of the Scientific Documentation Centre. A full-time staff, including a local project manager, system programmers, applications programmers, information specialists and librarians was dedicated to work closely with the consultants. Separate teams were formed to deal with each applications sub-system referred to below as SDCBIOSIS and SDCINSP (the local versions of the

BIOSIS and INSPEC files), SDCISDS (the serials union catalogue derived from ISDS records) and SDCMARC (the monograph union catalogue created from LC/MARC (Library of Congress Machine-Readable Catalogue) records).

Local team members were not restricted to simply assisting and sitting by the consultants but were assigned tasks to be solved on their own. For example, the system specification for processing INSPEC tapes, using the consultants' specification for BIOSIS as a model, was developed by the local staff, then revised and implemented jointly with more and more involvement of the Iraqi partners.

As a warm-up activity, a DIALOG Introductory Course and workshop was held to illustrate the potentials of on-line technology for the librarians on databases similar to those which were to be developed locally. In addition to the direct advantage of being able to conduct quite efficient searches on DIALOG soon after the training, this strategy proved to be effective also from the point of view of acquainting the librarians with the technology and preparing them to formulate their requirements for the local databases.

A draft specification was prepared for each sub-system, dealing with such matters as the conversion of magnetic tape records, error-checking of input data, the exclusion/addition of data elements, the structure and content of imported and locally-created records, the requirements with regard to direct access points and the format and content of displayed/printed outputs. The databases were initially created from sample records, tested, and then revised jointly on the basis of experience of the test period.

The abstracting/indexing tapes obviously constituted the easier part of this work, requiring no additional data and only a minimum of error-checking with fairly simple outputs. The cataloguing databases, on the other hand, required extensive error detection, correction and addition of local data, as well as the restructuring of the imported records in accordance with the facilities of the applications program for adequate filing, cross-referencing and index creation.

The SDCISDS sub-system presented the most challenges in locating the unique identifiers (ISSN) by which bibliographic records could be retrieved, in tracking the ever-changing titles due to the frequent marriage, divorce, death, rebirth or simple name changes of serials (not always resulting in new ISSNAs), in consistent correction of records originating from several national ISDS centres, and in devising an informative, easy-to-understand notation system for records of library holdings.

The SDCBIOS sub-system was developed first, since its introduction had an instant and tangible impact on the quantity and quality of information services in the life sciences and reached many users. It was followed by a sample SDCINSP database of

10,000 records. When adequate disk capacity is available, this sub-system will be regularly maintained by update tapes.

The SDCMARC and SDCISDS sub-systems were developed simultaneously. Only test versions have been implemented so far. Their full implementation will depend on the quantity and quality of manpower available to undertake the preparation of complete catalogue records. Both of the cataloguing databases, though they lack local data at present, provide powerful tools to get information about the monograph collection (10,000 volumes) and the serials collection (3,000 titles) rapidly, easily and flexibly. With each of the sub-systems, there was a two-month test period for selected users who provided valuable feedback to enable the teams to revise and finalize the sub-systems. The test period also provided time for the information/library staff to gain experience in operating the services without particular stress.

### SDCBIOS

This database is created by processing the BIOSIS previous tapes from 1984 onward. Due to limitations in secondary storage capacity, the bibliographic records of the two most current years can be made available on-line instantly. After more than two years of supply of data have been processed, i.e. from 1986 onwards, the less recent data will be stored off-line and reloaded on demand. Backfiles of BIOSIS between 1969 and 1983 will be accessed via DIALOG. The database can be directly accessed by:

- title words;
- added keywords (used to augment title information);
- concept codes (controlled identification of subjects);
- biosystematic codes (controlled identification of organisms) and the combination of any of these by Boolean logic. The set retrieved by Boolean operations on the direct access points can be further limited or refined by using non-indexed elements such as language, publication year, document type, etc. Actually, any element in the records can be used as a criterion to limit the subject search, or as a search criterion by itself, since the CDS/ISIS program allows string-searching for non-indexed elements.

This facility makes it possible to do searches which cannot be done through DIALOG, for example to compile a list of references to publications from a certain country or company or journal. Obviously, string-searching is rather slow and is used only in exceptional cases. (Readers familiar with DIALOG may recall that it permits both searching and limiting

only by those elements which were used to create the index-file)

Storage limitations meant that it was not possible to process the abstracts and include them in the bibliographic records. Even one year's bibliographic records without abstracts required 200 Megabytes of disk storage on-line. The lack of abstracts, however, is not an exceptional situation: DIALOG itself made the texts of abstracts available on-line only after more than ten years of service. The bibliographic citations themselves provide quite comprehensive information about the source documents even without abstracts. Moreover, if in doubt, the user can consult the printed version of *Biological Abstracts*, which is available locally, to decide if the cited document is relevant or not.

Compiling a subject bibliography in the biosciences now takes an average of two hours as compared to several days using manual methods, and even the existing database, with half a million records on-line, makes it possible to conduct quite comprehensive subject searches. In addition, the bibliographies can be regularly updated if required, with negligible extra intellectual effort. The search profiles — representing the subject interest of the user by the combination of subject terms, concept codes and biosystematic codes, etc. — are stored and can be run against the new records entered into the database each month. This makes it possible to provide a current awareness service for the user which could not be done at all in the manual system. The local database can also be used to prepare a search strategy for those cases where the backfiles of BIOSIS also need to be searched through DIALOG. A considerable amount of connect time (and money) can thus be saved by avoiding expensive on-line search formulation and testing on DIALOG.

The producer of the database was extremely cooperative. In addition to its first-class Search Guide, BIOSIS provided a course free of charge on searching its database in Baghdad, reviewed and commented on the SDCBIOS user manual and was quick to replace tapes which were sometimes lost between Philadelphia and Baghdad.

### SDCINSP

This database is created by processing all sections of the INSPEC tapes: physics, electric and electronic engineering, computer and control and information technology. Records from 1985 onwards are processed and the bibliographic citations for the most recent two years are made accessible on-line. Backfiles of INSPEC between 1969 and 1984 will be accessed via DIALOG.

The database can be directly accessed by

- title words
- descriptors from a thesaurus
- identifiers

## Computerizing information services in Iraq

and combinations thereof. All features described under the SDCBIOS sub-system apply here as well, i.e. string-searching by any elements of the records, SDI service, search profile preparation, etc.

INSPEC also provides a set of excellent documents which greatly facilitated the implementation and efficient use of this database.



The SDC Computer Centre

### SDCISDS

This database includes cataloguing records of the serials collections in the eight libraries participating, covering also ceased and cancelled titles. The total collection at present amounts to 3,000 titles, of which approximately 10 percent are non-English ones, mostly in Arabic.

Catalogue records for more than 2,000 serial titles could be retrieved from the ISDS Master and Update Tapes based on the verified ISSNs of the serials. For the remaining titles which either do not have an ISSN, or which have an ISSN but are not described in the ISDS tapes, catalogue records are created locally.

Imported records are corrected and complemented by local data, such as location, holding, subscription and other statements. Record descriptions are verified by using the local Kardex file, the most current editions of Ulrich's *Periodicals Directory*, *Irregular Annuals and Serials* and the serials themselves. This process of comparison and verification is needed because the records retrieved from the ISDS tapes originate from many contributing ISDS National Centres who do not consistently apply the specifications of ISDS, giving rise to records which are frequently incomplete and outdated. Ulrich usually contains more recent information and always includes the classification code of the serial. This cleaning-up of the records is rather time-consuming but worth the investment as the database is the on-line union catalogue of serials and the source for its printed counterpart or subset thereof. Despite their contamination, ISDS records constitute a very good basis to start from in a retrospective conversion project.

The database is directly accessible by

- title words (including title proper, key title, variant, parallel, former, successor, related, sub-series parent series and other language edition titles);
- issuing body names;
- Dewey class numbers;
- country codes;
- publication status;
- frequency;
- ISSN;
- subscription status;
- subscription agent;
- subscription number;
- location code

and any combination of these. The relatively small size of the database made it possible to invert all the elements of the serial records which are likely to be primary search criteria. However, any element in the record can also be searched by string-searching.

The on-line database is a very powerful tool in searching for serials whose title is incorrectly recalled or which meet a combination of certain criteria. For example, a search for active currently subscribed British, American, Canadian and Japanese journals of toxicology published in English takes only some seconds.

Printed union catalogues can also be created with ease and flexibility, both in terms of selectivity and record content. The printed catalogue can be restricted to holdings of particular libraries, to specific subjects, countries and/or publication types, etc. Catalogue records can be printed in various formats ranging from title-only to full format. Cross-references from alternate, parallel, former, successor, etc. titles are included, as well as various indexes like issuing body and subject indexes. Service catalogues arranged, for example, by subscription status or agent, can also be produced.

This sub-system represents a very considerable improvement in providing access to the serials sources. Previously only the Kardex file and a rather rudimentary union catalogue without cross-references, which is rapidly becoming obsolete, were available to provide information about the collection.

Though both the ISDS Manual and the tapes contain several bugs and inconsistencies (which is quite natural with a new service created by international cooperation), the staff at the International Centre was very cooperative in correcting errors and advising on questions of implementation.

### SDCMARC

This database includes catalogue records of the monograph collections of the libraries of the Council,

now amounting to nearly 30,000 titles, of which approximately 5 percent are non-English language, mostly in Arabic.

This database does not replace, but rather, expands the present card catalogue, which is still used for known-item searching and for back-up in the inevitable cases when the computer system is down.

The database was created from the machine-readable records ordered from the same company which has been providing catalogue cards for the Council for a couple of years. To receive the catalogue records, either the ISBN or the LC card number, as appropriate, had to be provided. It was hoped that for the retrospective conversion records could automatically be supplied for all titles for which cards had previously been received, but the supplier insisted that the above identifiers be specified individually for each title.

The incoming records are supplemented by the codes of the library or libraries which hold the book along with the stock number(s), number of copies, etc.

For approximately 10-12 percent of the books, machine-readable records are not available from the supplier. For these, records must be created by original cataloguing which strictly follows the structure of the imported and converted records for format and AACR2 for content.

The catalogue is directly accessible by the following elements:

- title words;
- personal names;
- corporate names (including publisher);
- conference names;
- subject heading terms;
- series name words;
- language codes;
- publication date;
- LC call number;
- Dewey classification number;
- ISBN and LC card number;
- library code and stock number;

and any combination thereof. The database is mostly used on-line for compound subject searches, but a printed author/title catalogue with cross-references from added entry and variant titles and names will also be prepared when the addition of local information is completed. Lists of new acquisitions which can be tailor-made to meet the specified interests of particular users, will also be produced as required.

## CONCLUSIONS AND FURTHER DEVELOPMENTS

The project has achieved its dual purpose of implementing operational library and information sub-

systems and transferring related know-how to the local staff.

The present system has already considerably improved information services to the scientific community in Iraq, the utilization of the information resources available in the libraries of the Council and, through these, the support of the development and research work extending to many fields.

Computerization made it possible to offer new services, like SDI services, as well as more comprehensive and more timely information than in the manual system.

The local staff was very diligent and eager to learn and quickly acquired the knowledge necessary to extend the existing services and further develop the system by offering new ones. Further assistance might be needed in two fields. One of them is systems analysis, which will require familiarity both with the machine-readable information services available and the potential of the applications software. The other field requiring assistance is that which calls for familiarity with the system software environment and the basics of the applications software.

The local staff is not only capable of operating the above systems and services but, with some assistance in the fields indicated, also capable of extending them by:

- processing additional bibliographic tapes;
- creating databases of documents not included in the initial system, like Iraqi research and dissertation abstracts;
- including catalogue records of books and serials of additional libraries wishing to cooperate, like those of Baghdad University, Mistansirriya University, etc. The extra effort this will require will be negligible in comparison with the benefits.

Certain services are already being extended to users outside the Council: retrospective bibliographies are compiled and SDI services are rendered to scientists and researchers working at other Iraqi research and academic institutes. The greater the extent to which users will be served from the licensed abstracting/indexing tapes, the more efficient their utilization will be as the added cost of running additional profiles for bibliographies and SDI is relatively low.

The services can also be easily extended from the catalogue databases. Libraries wishing to join the union catalogues can check which of their titles are present in the SDCMARC and SDCISDS databases. For those available, they have to provide their own location, holding and subscription data, which will be added to the catalogue records. For those titles which do not appear in SDCMARC or SDCISDS, raw records may be retrieved from the original ISDS and LC/MARC tapes. They must then be converted and edited to comply with the SDCMARC and SDCISDS records and complemented by local data. Finally, for

## Computerizing information services in Iraq

those titles which are not present in the SDCMARC and SDCISDS databases, nor available from the ISDS tapes and the LC/MARC files, original records must be created by the library concerned. The on-line technology used for data entry makes it very easy to complement existing records and to add new ones to cover the collections of additional libraries. It is just as easy to prepare catalogues and title lists which are tailor-made to the requirements of the individual libraries in terms of content and structure.

In the long run, the most likely way in which the system will develop will be through implementation of network terminals to make it accessible from remote locations as well. It is very likely that microcomputers will be installed at the participating libraries and at major research centres to allow direct on-line searching from remote locations. These could also be used for automating other library functions like circulation, serials control, etc.

Cooperation between the Scientific Research Council and the Hungarian Computer Applications and Service Company proved to be very fruitful, and is to be extended for further computerization projects related to library and information work.

Iraq, with its vast resources and ambitious plans is a model in the Gulf area; the Scientific Documentation Centre will become a powerful and respected national scientific-technical focal point which itself can provide assistance to other developing countries in need of establishing centres with similar functions.

The experience of international cooperation outlined above has proved that consultancy projects may be implemented hand-in-hand with the recipients to allow them to master the know-how and that, by doing so, to realize the advice of an old proverb: if a fellow asks you for a fish, do not give him fish but teach him to fish.

### Notes and references

1. For an up-to-date description of the Computerized Documentation System/Integrated Set of Information Systems (CDS/ISIS) system and news of forthcoming developments, see *Information Development*, vol. 1, no. 1, pp. 15-18 and vol. 1, no. 3, p. 141.
2. Francis, S. Development of documentation and academic library services (Iraq). Technical report PP./1975-76/4.221.4, 1977.
3. Jacsó, P. Overall plan; application definition for the computerized library and information system

of the Iraqi Scientific Documentation Centre. Working document of the 909/IRQ/84/FIT project, Unesco, 1984.

### Abstract

**A large scale computerization project was initiated in Iraq to automate library and information work in support of the accelerating research and development work in the country. It was jointly implemented by the Iraqi Scientific Documentation Centre and the Hungarian Computer Applications and Service Company under the auspices of Unesco. Four databases were implemented initially: the local versions of the BIOSIS and INSPEC databases, a union catalogue of monographs from LC/MARC records and a union catalogue of serials from the ISDS tapes. The background and justification of the project are reviewed and an overview given of the design concepts, implementation and the major characteristics of the databases, services and products. The results of the project are evaluated and future developments discussed.**

Dr Péter Jacsó is Head of Library and Documentation Services at the Computing Applications and Service Company (SzAMALK) of Hungary. He was the manager of the Hungarian team of consultants in systems analysis, programming and training for the applications developed for automating library and information services. He elaborated the overall system plan and the specifications for the three of the sub-systems described in this article.

Dr Faik Abdul S. Razzaq is Director-General of the Scientific Documentation Centre of the Iraqi Scientific Research Council. In this capacity he has been directing the traditional library, documentation and information services, and managing the computerization project from the beginning. This included the setting up of a large computer centre, the development of organizational and service structure and policy, as well as the direct supervision of the work of the consultants and cooperation in the outlining and implementation of the computerized system.