

Regional Seminar for Latin America and the Caribbean  
on Techniques for Information Transfer in Science and  
Technology

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TOWARDS IMPROVED INFORMATION TRANSFER IN LATIN AMERICA AND THE  
CARIBBEAN - THE ROLE OF UNESCO

Reference document prepared by the Unesco Secretariat

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## A. INTRODUCTION

The objectives of the present Regional Seminar on Techniques for Information Transfer are:

1 - to inform information specialists and users on recent advances in techniques for information transfer and on international programmes promoting their application;

2 - to provide an exchange of experience on the development of information services, with a view toward identification of techniques which are useful in the region and appropriate to the different national needs and levels of development;

3 - to consider concrete measures for regional and international cooperation, with emphasis on the possibility for the establishment of information networks.

In order to fulfill these objectives the National Council of Science and Technology of Mexico has, in collaboration with Unesco, invited a number of distinguished experts from the region as well as representatives of several concerned organizations to discuss six major themes on information transfer. The findings and recommendations of the Seminar will be incorporated into a report which will be subsequently made available as a Unesco document to a wide audience, including Member States and interested organizations. In particular the report will be considered by the first UNISIST Meeting on Regional Cooperation in Information Policy for Development in Latin America and the Caribbean, which will bring together governmental experts from the region later this year.

In formulating its findings it is hoped that the present Seminar will have available the recommendations of the Intergovernmental Conference on Scientific and Technological Information for Development (UNISIST II), 28 May - 1 June 1979, which are expected to define strategies for future action at the national, regional and international levels. The major issues posed for discussion at the Conference have included several themes of special interest to the present Seminar: development of information services to meet user needs, strengthening regional cooperation and cooperation among international organizations in the information field, appropriate use of modern technology for information transfer, and improving coordination of information systems at the national level.

Suggestions on the rôle of Unesco in promoting the development of information infrastructure in Latin America and the Caribbean, particularly with respect to computerization of information services, are sincerely invited within the present Seminar. The Seminar could also consider possible mechanisms for continuing technical cooperation within the region. It may prove especially useful to propose concrete future action in the form of programmes or projects in both these areas.



The present reference document on the role of Unesco has been prepared by the Unesco Secretariat to facilitate the discussions, as a complement to the Basic Working Document prepared by CONACYT. The next section of the document provides general background on the Unesco programme. Thereafter follow sections designed to provide details pertinent to each specialized working group within the Seminar.

## B. INFORMATION AND DOCUMENTATION WITHIN UNESCO

The transfer of information has been promoted by Unesco (The United Nations Educational, Scientific and Cultural Organization) since the very inception of the Organization. Indeed, Article I of the Unesco Constitution stipulates that the Organization shall "maintain, increase and diffuse knowledge...by encouraging co-operation among the nations in all branches of intellectual activity...the exchange of publications...and other materials of information; and by initiating methods of international cooperation calculated to give the people of all countries access to the printed and published materials produced by any of them".

In view of the particularly vital importance of scientific and technological information in the development of nations, a long-term Unesco intergovernmental programme entitled UNISIST was initiated in 1973 following the recommendations of a five-year joint study with the International Council of Scientific Unions (ICSU) (1) and those of an Intergovernmental Conference on UNISIST convened by Unesco in 1971. The ultimate goal of UNISIST is a loosely connected world network of existing and future information systems, based on their voluntary cooperation.

From its inception until 1976 the Secretariat of the UNISIST Programme was located within the Science Sector of Unesco. During this same period, the long-standing Unesco programme for promotion of documentation, libraries and archives as a vehicle for cultural development was continued within the Culture and Communication Sector. With the maturation of the UNISIST Programme and the extension of UNISIST principles to information work in the social sciences and other fields, the 19th Unesco General Conference in November 1976 decided on the establishment of a single Unesco General Information Programme, and created an Intergovernmental Council of thirty Member States to guide the implementation process. The General Conference instructed the Council to ensure continuity in the development of the activities undertaken in the context of the UNISIST programme, and to promote the concept of the overall planning of national information systems (NATIS) paying special attention to increasing the contributions of libraries and to promoting the development of archives services. Commensurate changes were introduced in the structure of the Unesco Secretariat by creation of a Division of the General Information Programme combining resources of the former Division of Scientific and Technological Information and Documentation and of the former Division of Documentation, Libraries and Archives, DBA. The Unesco General Information Programme is recognized as the only information programme within the United Nations system designed to provide a general conceptional framework for information system development.



The four main objectives of the General Information Programme are defined within the Unesco medium-term plan (1977-82). (2) Within this framework activities are being pursued towards international cooperation and improvement of national capability for handling information, with special emphasis on the needs of the developing countries:

1. Formulation of information policies and plans

At the international level, Unesco participates in consultations on international information systems and contributes to study on information exchange and transfer of technology. At the regional level, working contacts are maintained with existing information networks and programmes such as those of the Council for Mutual Economic Assistance and of the Commission of the European Communities. Where formal regional cooperation in the field of information is not yet fully established, meetings of governmental experts on information policy development are sponsored to help establish appropriate conditions for enhanced cooperation. The first UNISIST Meeting on Regional Cooperation in Information Policy for Development in Latin America and the Caribbean is planned in this context in late 1979.

At the national level, liaison with the Unesco programme is ensured by national information focal points and UNISIST National Committees already established in sixty-two Member States, including ten in Latin America and the Caribbean. A national focal point is a governmental agency responsible for overall information policy and coordination of national activities. A UNISIST National Committee is a consultative body designated to advise on all aspects of information exchange and on liaison with the Unesco General Information Programme. Guidelines and assistance on information policy are made available to Member States upon request.

2. Establishment of norms and their dissemination

Normative action is an essential factor in improving access to information by all Member States. Unesco is therefore closely involved in proposal of norms for information work, cooperating closely with the International Organization for Standardization which is responsible for the ultimate adoption of international standards. Although such normative action is not generally linked to specific subject disciplines, assistance is available to specialized networks and services wishing to develop documentary tools compatible with the UNISIST framework.

A series of international directories of specialized information services has been sponsored by Unesco to foster their ultimate linkage into a voluntary world referral network. The world register of periodical titles is maintained through the International Serials Data System (ISDS) sponsored by Unesco, which comprises an International Centre in Paris and a network of national and regional input centres.



Unified communication formats are seen within UNISIST as a major pre-requisite to international exchange of information and data. In view of the basic importance of bibliographic descriptions, a standard machine-readable bibliographic format has been developed within the Unesco programme (3), and is maintained by a specialized centre (UNIBID) within the British Library. Although the UNISIST format has been adopted by many national and international information systems, other specialized formats are also available, such as UNIMARC which is increasingly used in the library field. Unesco is presently sponsoring work in collaboration with all interested parties towards a common exchange format for all bibliographic applications.

Standardized communication formats are also under development for exchange of records describing research projects and records containing numerical data; it is expected that these formats will serve to inter-connect information services handling project or numerical information with bibliographic services.

In order to promote application of available bibliographic standards to the totality of the world's published information, Unesco is pursuing, in collaboration with the International Federation of Library Associations and Institutions, a programme to assist Member States in achieving universal bibliographic control.

Further tools are being developed for the standardization of documentary terminologies, thesauri and indexing schemes. International UNISIST clearing-houses have been established to collect all information on existing thesauri and to recommend standardized terminology. Published guidelines propose standardized methods for thesaurus construction, and a "Broad System of Ordering" has been developed, allowing comparison among classification schemes and thesauri and identification of blocks of information for referral purposes.

In further work aimed at improvement of the quality of primary publications, regional associations of scientific editors are supported by Unesco, and a number of guidelines have been completed which propose standardized presentation of classes of primary publications.

The UNISIST Guide to Standards for Information Handling, which will identify and advise on the use of existing standards and guidelines, will be available by late 1979. All aspects of the information transfer chain will be covered: authorship and editing as well as library and information work.

### 3. Development of information infrastructures and specialized international information systems

Direct support is provided through the General Information Programme to international information systems of interdisciplinary nature. In the field of numerical data, a long-term programme in cooperation with ICSU/CODATA included establishment of the World Data Referral Centre, to help develop an international network of data referral services.



ISDS is another example, as is the ISORID system on research in documentation. (It should also be noted that other operational information services in the fields of education, science and culture, e.g. the Unesco Computerized Documentation System (see below) and specialized databases such as DARE covering ongoing research in the social sciences, are being administered by relevant programme units within Unesco, rather than under the direct responsibility of the General Information Programme).

At the regional level, pilot projects are sponsored to promote the introduction of modern information techniques such as computerized information retrieval services and library automation, and regional programmes for cooperation are pursued, often with international funding bodies such as the United Nations Development Programme (UNDP). Examples of such activities in Latin America and the Caribbean include pilot projects for selective dissemination of information in Argentina and Mexico, and also the present Seminar.

At the national level, published UNISIST guidelines are available to assist in surveys of existing information facilities and in development of national information systems and services. Advisory missions and technical assistance in all aspects of national information system development are made available by Unesco to Member States. For example, Unesco consultant missions in the field of scientific and technological information have been sent to more than ten countries in Latin America and the Caribbean since the inception of the UNISIST Programme, and an equivalent number of countries have received short-term fellowships, equipment or financial assistance through Unesco in this field. In addition, extensive assistance is made available to Member States through UNDP projects within the framework of the Unesco programme, e.g. large scale ongoing projects for the development of national information systems in Colombia and Venezuela.

#### 4. Training and education of professionals and users of information

The Unesco General Information Programme aims to help developing countries build up facilities for systematic, formal training of needed information manpower. In the meantime, support is provided for international training of managers and advanced specialists for national information systems, and of teachers for national training programmes. Within the General Information Programme nearly thirty international courses were sponsored during the 1977-78 biennium, ranging from short refresher courses and seminars to full-year training programmes. Each course is arranged in cooperation with host-country authorities to accommodate 20-30 participants from developing countries, whose participation is often facilitated by travel grants from Unesco funds. Examples of regional courses held in Latin America and the Caribbean are a course for managers of information systems (Mexico, 1975) and a Seminar on indexing languages (Argentina, 1978).



Several guidelines are available on the organization and on the evaluation of training courses as well as two major educational publications: a handbook (textbook) for a first course in information science and a manual for the education and training of information users.

In developing training activities, Unesco is working in close cooperation with other concerned international organizations. For example, a basic manual for untrained staff members is being developed in collaboration with FAO and IAEA and will be applied initially within AGRIS and INIS, and several training courses are given each biennium with the cosponsorship of other international organizations.

Operational documentation services within Unesco are administratively distinct from the General Information Programme. The principal Unesco information services include the Unesco Library, Archives and Documentation Services within which the computerized documentation system (CDS) provides service to outside users as well as internal support for the Unesco programme. The objectives of CDS are:

- a) to achieve bibliographic control of the documents and publications of Unesco;
- b) to provide information to the Member States on the Unesco programme as reflected in its documentation; to facilitate access of Unesco staff to specialized data bases;
- c) to develop information and documentation software, in cooperation with other United Nations agencies, for use in participating organizations and institutions of the United Nations System and its Member States;
- d) to act as a demonstration and training centre for advanced computerization techniques in information processing, storage and retrieval.

Support is provided through the General Information Programme for Participation of Member States in activities under c) and d) above, designed to promote development of national infrastructure and training of information personnel.

#### C. MEETING USER NEEDS FOR SCIENTIFIC AND TECHNOLOGICAL INFORMATION (WORKING GROUP I)

The UNISIST programme was conceived as a focus for cooperation among the scientific and technological communities, information specialists and governmental authorities in meeting worldwide user needs.

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+ International Information System for the Agricultural Sciences and Technology (sponsored by the Food and Agriculture Organization of the United Nations).

++ International Nuclear Information System (sponsored by the International Atomic Energy Agency).



This approach was emphasized in the recommendations of the UNISIST feasibility study which stated that "the rationalization of information handling...is not an end in itself: any improvement in the information resources of science and technology has to be evaluated...against a broader concept of its utility to scientists and other groups in the world community. To the individual scientist, first, UNISIST should mean increased opportunities of tapping the world sources of knowledge, both quantitatively and qualitatively" (Ref.1, section 11.3).

UNISIST activities have therefore placed emphasis on user needs, many of which can be met by publication and dissemination of primary specialized literature, strong documentation centres and libraries in close contact with the users and comprehensive indexing and abstracting services. The previous section stressed the role of Unesco in promoting responsiveness to these needs through support for development of national information systems and through cooperation at the international level.

A significant proportion of needs for existing knowledge cannot readily be satisfied by the primary and secondary literature, because the latter is insufficiently clear, concise, reliable or accessible in specific areas of interest. Although critical reviews and related products have traditionally served scientists' needs for quality control and synthesis of information, the UNISIST feasibility study pointed to the possible need for a greater number of specialized information analysis and consolidation centres, responsible for evaluation and compression of information. This was confirmed by two international expert meetings convened by Unesco in 1975 and 1978, which stressed the special needs for such units in the developing countries, eg. covering areas of particular interest such as natural products, commodities and appropriate technologies. On the basis of these recommendations Unesco is finalizing guidelines for establishment and operation of such units and is planning to extend methodological and technical assistance in this field.

Needs for numerical scientific and technological data represent a related problem from the viewpoint of the users, but have been considered separately within the UNISIST programme because of the special techniques needed for handling data. In addition to being found in the primary literature, numerical data are made available through data compilations and through specialized information centres (data centres). Unesco has been promoting a number of activities to improve access of scientists and engineers to numerical data, in close cooperation with the long-term programme of ICSU/CODATA. One example of such activities is a series of international courses (Yugoslavia, 1976; Poland, 1977; India, 1978) to inform scientists on techniques for generating, presenting, and gaining access to data. Another is the World Data Referral Centre (WDRC) project initiated by CODATA with Unesco assistance in 1977; the aim of the WDRC project, located in Paris, is essentially to prepare directories of sources of data (compilations, data centres, individual experts) and to help national information and documentation centres employ them to direct users to the data they need.



Another growing problem of the scientific and technological communities is that of keeping abreast of ongoing research efforts. Unesco has initiated activities within the General Information Programme to help determine user needs and develop specialized information services in this field, which will be treated in section G of this paper.

The above classes of user needs have been reviewed from a global perspective. The major problem within a country or region is that of determining the information needs of specialized user groups involved in sectors of development activity, such as industrialization, and providing them with information in appropriate form for application.

Several approaches are available for determining and meeting user needs for information. One of the most effective is user feedback in the context of existing information services. Another is consideration of user needs by organizations representing the user communities. Unesco has promoted the work of international and regional scientific organizations in this area, eg. the Committee on Engineering Information of the World Federation of Engineering Organizations and the several specialized committees of the International Council of Scientific Unions (ICSU Abstracting Board, CODATA, Committee on Science and Technology in Developing Countries, etc.). Finally, progress has been made, especially in the developed countries, on implementing social surveys designed to assess user needs; Unesco is preparing guidelines on the methodology for such user studies (4) and is prepared to consider providing technical assistance on their implementation at the request of Member States.

In the above context the present Seminar should be in position to advise on the following questions:

- What are the needs, both quantitative and qualitative, for scientific and technological information in the region ?
- How well have they been met by existing information services and programmes ?
- What further action, eg. at the regional and international levels, is required to determine user needs and to help satisfy them ?

#### D. COMPUTER NETWORKS FOR BIBLIOGRAPHIC INFORMATION TRANSFER (WORKING GROUP II)

Computer communication networks have grown into a veritable industry in the developed countries during the past fifteen years, have dramatically improved access to secondary information services, and in turn have helped stimulate comprehensive identification and analysis of the primary literature. In well-known bibliographic applications host computers equipped for on-line bibliographic retrieval, such as those of the European Space Agency near Rome or of Lockheed Corporation in the United States, are linked to users through specialized telecommunications systems such as EUROMET, SCANNET or TYMNET. Such services are, however, not generally available in the developing countries.



With this situation in view, Unesco has undertaken action within its General Information Programme to gradually help Member States to benefit from teleprocessing technology for information retrieval. This action has taken two principal orientations: technical assistance to Member States wishing to gain access to international sources of information and promotion of strategies to ultimately provide universal access to information networks.

In the first area Unesco has provided consultant services to several Member States and assisted the National Documentation Centre of Morocco in establishing a permanent linkage to the European Space Agency data bank. In addition, pilot demonstrations of remote bibliographic information retrieval have been organized in India (1976) and Trinidad (1977) as a means to increase awareness of modern techniques among users and information specialists.

During this same period Unesco has sponsored study on improving access to bibliographic information on a worldwide basis. The most promising approach has appeared to be development of regional computer communication networks, detailed in a study for Unesco by the International Federation for Information Processing in 1974-1975, hereafter referred to as the IFIP study (5). This approach was endorsed by the UNISIST Working Group on Technology of Systems' Interconnection which met in Paris in 1976 and recommended the following international strategy.

1. Implementation of least cost pilot networks in developing regions.
2. Attachment of these pilot networks to existing and planned local databases in various disciplines.
3. Permanent or intermittent connection of the pilot networks to existing general documentation centres in developed countries by means of leased lines or through the existing telex or telephone networks.
4. Integration of the individual pilot networks into larger networks by interconnection.

The region of Latin America and the Caribbean was recommended as a site for one of the first pilot networks by both the IFIP study and the UNISIST working group, as well as in the study report of a 1977 Unesco consultant mission by Mr. G.F. Romero. (6). One of the principal purposes of the present Seminar is to further explore the need and feasibility for pilot bibliographic information retrieval networks in Latin America and the Caribbean, on the basis of the studies already completed. The host organizers of the Seminar have arranged for practical demonstrations of information retrieval to facilitate the deliberations. The following paragraphs will briefly review some of the main points which should be considered, and some options for future action.



### Structure and advantages of a regional network

Regional information networks can enable optimum utilization of resources for cooperative processing and retrieval of information within the region in an appropriate form for regional use, as well as linkage to international sources of information. The latter links can be established on advantageous terms by offering a larger market to extra-regional services and by making available consolidated regional services to the international market. The regional approach to computer communications networks has already been developed in several operational and planned systems in Europe.

Several basic network structures are possible, distinguished by different levels of participation of the network centres in computerized information processing, and by different patterns for telecommunications links among the participating centres. The simplest network configuration is that of a "star" with a single regional information centre linked (eg. by leased telephone lines) to each of several main user centres which become nodes in the network. The nodes in turn may provide information to outside users in their immediate area, eg. through dial-up telephone connections. The regional centre may use its own computer to process and retrieve information or may serve only as a point of connection to information sources outside the region. The first alternative, although technically more complex and involving greater start-up costs, holds the advantage of enabling input of regional information into the network. It may also prove appropriate for regional processing certain heavily-used external data bases, obtained in magnetic tape form.

Other more complex (distributed) configurations, generally employed in existing networks, may be called for when more than one node includes a host computer and databases, or when efficiency factors constrain the form of the telecommunications network. The simplest distributed configuration to envisage is a "ring" (or polygon) in which each principal node in the network is linked to two others; in addition, one or more of the principal nodes may be linked to international sources of information, to secondary nodes, or to dial-up users. The main advantages of a distributed network are that each of the principal national centres can upgrade its local services and furnish information to the network by means of its own computerized facilities. The main disadvantage is that the technical design of the network is more complex and costly, both from the point of view of telecommunications and from that of computer operations.

Dedicated telecommunications channels, eg. based on packet-switching technology, are generally indicated in a distributed computer communication network; such a solution may prove economically advantageous, particularly in cases where a high volume of information is foreseen or where the cost of telecommunications makes their efficient use especially important. A distributed network is also less vulnerable to link or node damage.

The optimum configuration for a regional information network can only be determined after a detailed feasibility study. In particular, the optimum pattern may well be more complex than the simple star and ring models described above in order to ensure adequate transmission rates and to decrease vulnerability.



### Network components and costs

Implementation of a regional computer communication network is a major undertaking involving several steps and components which are treated in detail in the IFIP study, and can only be briefly considered here.

#### 1. Computing and information processing

The IFIP study roughly estimated the annual hardware and software costs for a regional computer centre responsible for information retrieval at US\$ 600,000 to US\$ 900,000 depending primarily on the size of the databases employed (100,000 to 1,000,000 references). To this should be added personnel and administrative costs, as well as the costs of producing or subscribing to databases. However a regional network would normally build on existing endogenous facilities for processing and retrieval of information (eg. national information centres), considerably reducing expenses in this field.

#### 2. Telecommunications

A typical computer communication network will require international telecommunications links among the nodes in the region (normally leased lines), local telecommunications links between each node and its individual users, and probably at least one international link between the network and an extra-regional source of information. The tariffs and conditions for national telecommunications are generally fixed by the appropriate national telecommunications administration, and those for international links between two countries are agreed by the administrations concerned.

The International Telecommunication Union (ITU) is the specialized agency within the United Nations System responsible for international telecommunications, and the International Telegraph and Telephone Consultative Committee (CCITT - part of ITU) is specifically responsible for issuing recommendations on technical, operating and tariff questions relating to telegraphy and telephony. A number of these recommendations are of specific relevance to regional computer communication networks:

Recommendation D1: General principles and conditions for the lease of international...telecommunications circuits.

V-series Recommendations - Use of telephone and wide-band circuits for data transmission.

X-series Recommendations: Public data networks.

Telecommunications costs within a regional network will in practice also depend greatly on the type and quality of the circuits required. It is of interest to note that the IFIP study estimated the annual lease costs of regional lines linking the six national nodes of a network in the Andean sub-region at about US\$ 860,000 and the annual cost of each extra-regional link for the same network at about US\$ 245,000. The Romero study foresaw an annual cost of about US\$ 57,000 for intra-regional links among the three nodes in a Central American network.



The first UNISIST Meeting on Regional Cooperation in Information Policy and Planning for Development in Latin America and the Caribbean, planned in late 1979, would be a logical forum for formal consideration of regional computer communication network. The recommendations of the present Seminar on the various aspects of information network development can be put before the above meeting and also submitted for consideration by Member States and concerned international organizations.

#### E. ON-LINE INFORMATION RETRIEVAL AND PROBLEMS IN DOCUMENT DELIVERY (WORKING GROUP III)

In recent years the computer has greatly facilitated the tasks of constructing large bibliographic databases and of retrieving information from them. On-line techniques have added a new dimension in both these areas, particularly so in information retrieval with the advent of interactive dialogue between the user and the computer.

Basic computerized techniques for building and exploiting databases are considered a priority need in many Member States. Unesco programme activities have therefore been oriented towards assisting Member States to apply these basic techniques and to upgrade existing services through introduction of on-line techniques at the appropriate time.

#### Development of national computerized databases

A major aspect of this effort is the transfer of Unesco's own experience in computerized documentation techniques, notably by making available the CDS/ISIS<sup>+</sup> software package, developed for use within the Unesco Computerized Documentation System in 1975 from the original ISIS software of the International Labour Office. The characteristics of CDS/ISIS and the conditions for transfer to interested organizations are given in the "general description" available for the present Seminar.(?).

The CDS/ISIS system provides for database creation, maintenance and retrieval, handles alphanumeric data of fixed or variable lengths, and produces a wide variety of outputs (indexes, catalogues, etc.) as required. The system runs in batch mode under IBM 360/370 OS and in on-line mode with CICS-supported terminals. An inverted-file procedure is normally utilized for information retrieval; the size of the databases employed is currently limited to 100,000 records. The computer requirements, scheduling requirements and personnel requirements for installation of CDS/ISIS are detailed in Appendices 1 and 2 of the "general description".

Following agreement to transfer CDS/ISIS and prior to installation of the systems, project personnel of the receiving institution are familiarized with CDS/ISIS operations, normally through a three-week training course which has been organized for a number of years by Unesco in the spring (May/April) and autumn (October/November), usually in Paris. The language of a course may be either English or French, depending

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+ Computerized Documentation System / Integrated Set of Information Systems



on the participants. The course is designed to enable the attendees to install and begin using the package in a relatively short period of time. Hence a considerable portion of the time is spent at guided practical work, touching upon all the major system components. If sufficient interest is shown by institutions in Latin America and the Caribbean in obtaining CDS/ISIS, a training course may be held in the region in 1979-80.

After installation of the system and initial operations, usually carried out by the project personnel with the assistance of a short evaluation mission of an expert from Unesco, the new installation should be autonomous and require no more direct assistance.

However, Unesco ensures close contact with CDS/ISIS users concerning maintenance and updating of the system through circular letters and a special CDS/ISIS System Maintenance Data Base (SMDB) where all system changes are recorded; listings and indexes of this data base are regularly sent to all users.

Follow-up is provided in one or more of the following ways:

- a) Visits of Unesco experts at the various installations;
- b) Technical advice by mail, telex or telephone;
- c) Regular shipment of new system releases and related up-to-date documentation to every installation.

A complete set of system documentation, available to CDS/ISIS users and employed as support material during CDS/ISIS training courses, consists at present of the following manuals:

i) CDS/ISIS: A general description

An introductory, non-technical manual giving a general yet fairly complete description of the functional capabilities of the system (36 p.)

ii) CDS/ISIS - Terminal Operator Manual

Designed for terminal operators reference giving a complete description of the on-line data entry and search processors. (100 p.)

iii) CDS/ISIS - Reference Manual

Designed for systems analysts reference, contains a technical system description, programme parameters and JCL, catalogued procedures, file and record formats, as well as quick reference tables (240 p.)

iv) CDS/ISIS - System Installation Manual

Describes in detail the system generation procedures and contains guidelines for the tailoring of the system to a particular computer installation. (47 p.)

All manuals are maintained in machine-readable form and regularly updated. The manuals are stored on the system tape together with the CDS/ISIS programmes and catalogued procedures. In addition to the manuals described above Unesco also issues Technical Notes to cover specific technical topics, guidelines and procedures concerning the system.



At present time, the CDS/ISIS system is operating at several international organizations (FAO, Unesco, UNIDO) and at the following national installations:

Brazil	- BINAGRI, Brazilia
Bulgaria	- Central Institute for Scientific and Technical Information, Sofia
Canada	- Industry, Trade and Commerce, Ottawa - Ontario Ministry of Education, Toronto - The University of Calgary
Peru	- Petroleos del Peru, Lima
Poland	- Management Organization and Development Institute, Warsaw - Institute for Scientific, Technical and Economic Information, Warsaw - Technical University of Wroclaw
Sénégal	- Centre National de Documentation Scientifique et Technique, Dakar
Sweden	- AB Bofors, Bofors
U.S.A.	- Princeton University, Princeton, N.J.
U.S.S.R.	- The U.S.S.R State Public Library for Science and Technology, Moscow
Yugoslavia	- National and University Library, Zagreb

National information systems are frequently responsible for providing specialized information services which are non-bibliographic in nature, and computerization should account for these varying needs in so far as possible. Two types of information services which can be easily accommodated within most software packages oriented toward bibliographic services, including CDS/ISIS, are registers of research projects in progress and referral registers covering institutional sources of information. Other services requiring more specialized software are those providing numerical data, which may be scientific or statistical in nature. In addition, services such as library automation may be integrated into the same software supporting external services; although several earlier versions of ISIS contain specialized options in this field, they are not available at the present time in CDS/ISIS.

It should be emphasized that Unesco seeks to respond to the specific needs of Member States or organizations requesting assistance on computerization of information services. Software made available directly through Unesco cannot be universally applied; indeed, in addition to CDS/ISIS installations and CAN/SDI projects (described in Section F), Unesco has worked to facilitate other solutions in specific cases based on expertise available through other international organizations, bilateral agreements or commercial concerns.

#### On-line access to international sources

On-line linkage to computerized information-retrieval networks has become an established practice in the industrialized countries. But despite increasing interest in extending on-line access to these networks for the developing countries several obstacles are preventing rapid implementation of this process. Insufficiency of appropriate telecommunications channels represents an important factor in many developing regions. Administrative, legal and financial problems, common



to all aspects of international information transfer, are often more complex in the case of on-line linkages. At the present time only three developing countries (Mexico, Morocco and the Philippines), adjacent to industrialized regions, have established permanent on-line to major international information networks.

The exploitation of international databases obtained in magnetic tape form may thus be considered as a viable alternative or complement to international on-line linkages for many developing countries, especially when implemented on a regional basis.

The role of Unesco in assisting individual Member States to establish on-line links to international networks, and in promoting regional cooperation to facilitate this process, has been treated in Section D. In this context working contacts are maintained with existing international networks and database producers, particularly with a view towards extension of international participation and accessibility.

#### Training of documentalists, intermediaries and users

Training of documentalists and intermediaries in on-line techniques has not generally been considered as a separate priority within the Unesco programme, since it has been felt that these important skills can best be acquired through experience with operational systems once basic documentation techniques are mastered. UNISIST training activities have thus emphasized basic techniques for collection, analysis, processing and retrieval of bibliographic information.

However, to complement the training in computer operations within CDS/ISIS courses, Unesco accepts documentalists for short-term practical training with its Computerized Documentation System and provides demonstrations for users. Demonstrations of on-line information retrieval from international databases and practical training of documentalists in existing facilities, are also organized within the Unesco programme at the request of Member States.

#### Document back-up for computerized services

Although several computerized information services are now providing numerical data in addition to bibliographic data, it is not generally feasible for computers to provide full information services, including texts of documents. Computerized services should therefore not be seen as a substitute for document collections and document delivery services, but as a complementary tool to improve their use.

This complementary role is increasingly being developed by bibliographic information services, many of which are also providing document delivery services, sometimes with the possibility of ordering documents on-line at the time of retrieval. From another point of view, libraries and documentation centres are increasingly exploiting databases constructed in the process of cataloguing for computerized information retrieval. Unesco assistance in developing such activities can be provided upon request from Member States.

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+ Except in some specific cases, such as legal information systems



Delivery of originals or copies of documents may also be improved through regional cooperation. Several successful examples of such cooperation already exist in Latin America and the Caribbean, and Unesco is presently sponsoring, in collaboration with the Latin American Commission of the International Federation for Documentation, a feasibility study on wider cooperation within a regional network for document delivery. Such a network would draw heavily on existing national and regional infrastructure and might fulfil some of the following functions:

1. Cooperation in acquisition and cataloguing of documents, as is presently being implemented, for example, in several countries in Central America through the OAS sponsored Centro Catalográfico Centroamericano based in Costa Rica. It should be noted that this type of cooperation can provide useful regional databases for the end-users, as well as tools for cooperation among libraries and information centres.
2. Regional document delivery services providing copies or original documents through inter-library lending. This type of service can be based on a regional network of libraries such as is evolving in the agricultural<sup>+</sup> field through AGLINET<sup>++</sup>, or on centralized collections as in the BIREME programme for medical documentation.
3. Publication of regional editions of major international scientific journals, perhaps as regional microfiche editions, in agreement with the original publishers.

The study underway, which is expected to be available in preliminary form to the present Seminar, will particularly emphasize the possible uses of modern technology (eg. telecommunications, computerization, reprography) in the network for document delivery which in turn would be designed to back up regional efforts to provide computerized bibliographic information services to users.

Queries about Unesco assistance in the field of on-line techniques including applications in document delivery, as well as suggestions for concrete action and programme orientation in the future, are welcomed within the present Seminar.

#### F. SELECTIVE DISSEMINATION OF INFORMATION (WORKING GROUP IV)

Current awareness services, whether manual or computerized, are increasingly expected by the users of information centres. Retrieval of information from current files is also technically simpler and less costly than retrospective retrieval from very large databases, making SDI services from large international databases immediately feasible in many

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+ Worldwide Network of Agricultural Libraries, sponsored by FAO

++ Regional Medical Library sponsored by the Pan-American Health Organization.



developing countries. Unesco activities in computerized documentation have therefore aimed at promoting selective dissemination of information from both international and national databases.

### CAN/SDI Pilot Projects

In order to evaluate the feasibility of linking developing countries to world sources of information through bibliographic magnetic tape services, Unesco sponsored, in co-operation with the Canada Institute for Scientific and Technical Information (CISTI), three pilot SDI projects during the period 1974-1976. The projects were centred at:

- i. Centro Argentino de Información Científica y Tecnológica, Buenos Aires, Argentina;
- ii. Indian National Scientific Documentation Centre (INSDOC), New Delhi, India;
- iii. Consejo Nacional de Ciencia y Tecnología, Mexico City, Mexico.

Each project provided SDI services free of charge for a period of one year to about one hundred researchers mainly in the host country but including some users in neighbouring countries. The services were based on Chemical Abstracts Condensates Tapes generously made available for an initiation period of one year to developing countries on the basis of handling charges only. The CAN/SDI software was provided free of charge by CISTI, as was a one-month training course for a documentalist/search editor and computer specialist from each centre. Unesco provided support to each centre to defray the costs of training and initial tape services.

The SDI pilot projects in Argentina and India were evaluated by the Documentation Centre of French Petroleum Institute under contract to Unesco, on the basis of user questionnaires circulated by the national participating centres. The evaluations were intended to identify the characteristics of the user population, information-gathering behaviour before and after use of the service, effectiveness of the service and cost-benefit relationships. A detailed evaluation report with guidelines for future SDI projects is already available in preliminary form and only the major results of the evaluation, which were remarkably similar in the two pilot projects, are presented here: (8)

- i. the typical user was a researcher of about 43 years, working in a university or government research organization. He spent on the average about 16 hours a week in identifying, obtaining and assimilating documentation before commencement of SDI services;
- ii. about 70% of the references provided were considered pertinent by the users after an initial period of profile adjustments, and about 84% of the users felt better informed due to SDI;
- iii. the average researcher reported a reduction of about five hours/week in time spent satisfying documentation needs as a result of the service;



- iv. the benefit of the services in terms of savings of researcher's time was shown to outweigh the costs (computer expenses and personnel) of the services for both pilot projects; in India (the less profitable case) the benefit to a senior-level researcher exceeded the cost by a factor of two, while the benefit to a junior-level researcher approximately equaled the cost. Introduction of the full market cost of a commercial database would not fundamentally alter the above conclusion, adding perhaps 20% - 50% to the cost of a service for 100 users; in general, operating costs per profile would be expected to decrease regularly with an increasing number of users.

All three SDI pilot projects are continuing under national financing and are expanding in terms of both clientele and database coverage, and a fourth project is already being initiated in Nigeria under the aegis of the National Science and Technology Development Agency. The positive results of these projects and continuing international interest in CAN/SDI, notably at an International Seminar on SDI organized by the National Research Council of Canada in cooperation with Unesco in 1978, have led to measures to make the package more widely available which are described below.

#### Availability of CAN/SDI

The National Research Council of Canada and Unesco have agreed on an initial programme for the further development and distribution of CAN/SDI. Under the agreement CAN/SDI software, while remaining the property of the National Research Council, has been integrated into the CDS/ISIS package of Unesco. Unesco in turn will accept overall responsibility for distribution of the CAN/SDI system to international organizations and to other organizations in Member States of Unesco other than Canada. The programme will continue at least until August 1979 and is expected to be extended if satisfactory results are obtained.

The CDS/ISIS-CAN/SDI software will encompass a wide range of documentary functions. The CAN/SDI component will permit selective dissemination of information from a large number (presently 17) of international databases in magnetic tape form. The CDS/ISIS component will enable bibliographic control, retrospective retrieval services and selective dissemination of information in batch or on-line modes, using national databases, and will permit the building of moderate-size inverted files from the international databases utilized for SDI services. The two components are compatible both in terms of bibliographic format and computer requirements.

Dissemination of the CDS/ISIS-CAN/SDI package has been organized along the same lines as that of CDS/ISIS. Upon signature of an agreement between a requesting organization and Unesco, training for computer personnel in CAN/SDI will be associated with training in CDS/ISIS operations, by extending the regular CDS/ISIS training courses to cover a four-week period. Training for search editors will be organized separately at existing CAN/SDI installations. This approach is called for since operational experience with the individual tape services in question, not available at Unesco, is required for effective search editor training. No fees will be charged for training except that each



participating organization will generally bear the travel and living expenses of its trainees. In the case of requests from the developing countries, Unesco will endeavor to seek financial assistance for training, either through its own programme or through extra-budgetary sources, and to facilitate access to international databases under preferential conditions.

As with the CDS/ISIS package, organizations receiving the CAN/SDI system through Unesco will be free to keep and use the system indefinitely, and will be expected to be able to continue SDI services without further direct support from Unesco.

### The role of international cooperation

The development of SDI services in Latin America and the Caribbean could greatly benefit from increased international cooperation involving both organizations operating SDI services and database producers. At least four types of such future international cooperation can be considered:

#### 1. Cooperation in providing SDI services

The cost of international bibliographic databases is usually high, and cost-effective services can only be established with a large number of users. This may be best accomplished in the case of smaller countries by extending services to users in neighbouring countries. Within a geographic region a single organization might provide services based on several databases, or several organizations might take responsibility for services from certain databases in specialized fields. The same type of cooperation could cover provision of original documents identified by the services, already considered in Section E.

The cooperating organizations in an SDI network should be linked by good postal channels and by a willingness to participate in the network. This type of cooperation could be seen as a prelude to establishment of on-line links among the cooperating centres.

#### 2. Cooperation in development and dissemination of SDI software

An informal user group of CAN/SDI centres, similar to that already existing among users of CDS/ISIS, is expected to facilitate exchange of information of system maintenance and improvement. A subgroup of CDS/ISIS-CAN/SDI users in Latin America and the Caribbean could be organized and might also include centres employing other functionally similar systems used in the region.

#### 3. Cooperation in training

With respect to use of international databases, it will be necessary to enlist the assistance of operational SDI installations in the training of search editors for new installations. Such training could be organized on a regional or international basis, and might ultimately cover computer techniques as well as documentation techniques relevant to SDI. The concept of regional training activities is attractive from several points of view, since costs may be decreased in this manner, and common language and orientation among the trainees is more easily ensured.



#### 4. Cooperation between SDI and database producers

Several factors inhibit transfer of information from producers to users especially where transfer to developing countries is concerned. The most important factors are financial, and the exchange of computerized databases is therefore facilitated by favourable terms such as those offered to organizations in developing countries by several producers. A register of such possibilities for access might prove welcome in this context.

Constructive suggestions on these and other aspects of international cooperation in SDI are sincerely invited by the Unesco Secretariat.

#### G. INFORMATION SERVICES ON RESEARCH IN PROGRESS (WORKING GROUP V)

Initial priority action within the UNISIST programme concentrated on published information which was widely disseminated in individual developed countries, but not sufficiently accessible by all Member States. However, it soon became apparent that information on research in progress would also have to be considered in achieving the goals of UNISIST in order to make effective use of pre-publication information for the planning, management and implementation of research. This need had been well testified by a rapid expansion in national information services treating research in progress and specialized ongoing research information systems at the international level. The readiness of Member States for wider cooperation in information on research has been further underlined by the United Nations to promote the establishment of a New International Economic Order "giving to the developing countries full access to the achievements of modern science and technology".

In 1975 Unesco responded to this trend in publishing UNISIST Guidelines on the Conduct of a National Inventory of Current Research and Development Projects as one of a series of documents designed to aid Member States in development of national information systems.<sup>(9)</sup> In the same year Unesco/UNISIST organized, in collaboration with the Smithsonian Science Information Exchange (SSIE) an International Symposium on Information Systems and Services in Ongoing Research in Science, which brought together nearly 200 participants from more than 50 countries, about half of which were developing countries. From the debate it was manifest that developing and developed countries were equally interested in information services covering research in progress.

At the end of the Symposium the need for the following concrete action by Unesco/UNISIST was seen to have gained general approval by the participants:

1) "To develop projects dealing with guidelines for unification of handling procedures such as data elements, communications, formats, etc. for the improvement of information transfer. This work, of course, requires the involvement of national and international organizations such as ICSU, ISO, FID and also of operational systems".

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+ See Resolutions 3201 (S-VI), 3222 (S-VI), 3362 (S-VII), 3507 (XXX) and 183 (XXXI) voted by the UN General Assembly, 1974-1977



2) "To develop a programme for advisory services based on national needs and providing technical assistance to Member States for the establishment and development of national services on ongoing research within the global, scientific and technical information systems".

3) "To encourage the development of [regional and] international co-operation in this field by organizing scientific meetings and acting as international focal point for information on ongoing research". For this purpose, a consultative working group would be set up "within the UNISIST Programme in order to find areas of cooperation and to assist the Unesco Secretariat in the development of its programme, to propose pilot projects and to evaluate the results of UNISIST work in this field".

As a first step in promoting further international cooperation, a worldwide inventory of information services on research in progress was initiated in 1976 with the collaboration of Unesco. An international consultation of experts responsible for information services on research in progress was convened by Unesco in October 1977 to review the international inventory and to provide guidance for continuing action within the General Information Programme. (10)

#### The worldwide inventory

The first version of the worldwide inventory of information services on research in progress was published in 1978 as a result of two years of data collection and analysis (11); it has been designed to serve two purposes: (1) as tool for referral of requests for information to appropriate information services and (2) as an analytical resource in the design and development of information services on research in progress.

The main body of the inventory consists of individual entries for 179 information services based on replies received from a UNISIST questionnaire from all regions of the world. 43 of these services are international or regional in coverage while cover 136 research in a single country. Thirteen of the services, including four with international or regional coverage, are headquartered in 8 countries in Latin America and the Caribbean.

In addition to the full name and address of each service, the following information is provided:

1. The coverage of the service in terms of subject scope, geographical area and research institutions;
2. The data elements provided on research projects, often including title of each project, investigators and affiliated institutions, project starting date, project objectives, subject descriptors, and citations to completed research;
3. The types of information service offered, languages of the service and conditions for access.

Additional details are given for each entry on techniques used in collection, processing and retrieval of information. Indexes to the inventory are based on the subject scope of the services, the names of the services and the persons responsible.



It is of interest to present some of the main conclusions of the statistical analysis provided in the inventory:

- Worldwide interest in information services on research in progress is a relatively new phenomenon; more than 50% of the existing services had been initiated within the five years preceding the inventory.

- This growth has been accompanied by (and in some cases can be attributed to), an expansion of cooperative networking for international transfer of information on research in specialized subject areas.

- Two distinct organizational patterns are evident concerning linkage of information services on research in progress with services providing published documents and bibliographic information; just under 60% of the services included in the inventory are operated within more encompassing information and documentation systems, while the remainder are operated independently.

- Although there is a certain "logical compatibility" among existing information services on research in progress, there is widespread technical incompatibility among the services due to the absence of standardized data elements or exchange formats. Increased transfer of information on an international basis would require steps to minimize these incompatibilities.

As a background study for the inventory, Unesco commissioned a survey and analysis of information services of developing countries on research in progress, which has been made available to the present Seminar. (12)

#### Current programme activities

Three distinct types of activity on ongoing research information are being sponsored within the General Information Programme in the context of the approved budget of Unesco for 1979-80.

1. The Unesco General Information Programme is continuing to act as an international contact point for exchange of experience on information services on research in progress. Possible activities will include (a) updating the worldwide inventory of information services on research in progress with a view to improving its utility; (b) sponsoring workshops such as the present Seminar to stimulate the development of information services; and (c) promoting user needs studies for information on ongoing research and preparing a brochure to stimulate user awareness.

2. Projects will be developed in the field of unification of information-handling procedures, in consultation with concerned organizations and paying close attention to existing information norms. A preliminary study on an international exchange format and recommended data elements is already being circulated for evaluation. (13)

3. Unesco will endeavour to provide advisory services and technical assistance on information on research in progress within its activities for development of infrastructure and training in the information field. It is expected that most Member States, as shown from the results of the UNISIST inventory, will wish to develop national information services on research in progress in close coordination with



information services already providing published information on research. At the international and regional levels, the exchange of information on ongoing research could also be promoted at the request of the Member States concerned; such exchange might well take the form of referral of requests among existing services, an approach which is already being developed in several fields.

A second international expert consultation will be convened in 1980 to advise on future Unesco activities on information on research in progress, with emphasis on techniques for extension of services to cover all fields of research serving social and economic development and for interconnection of national and international information systems.

In the above context, aspects of development of information services on research in progress to be considered by the present Seminar might include:

1. How can the services in the region be improved to better serve the users, and how can the users be informed of the services available on research in progress?
2. What relationships should be developed among information services in the region covering research in progress, and how can links be strengthened between them and overall national information systems?
3. Are regional and international programmes sponsoring activities appropriate for the development of information services on research in progress in the region, and how can participation in such activities be improved?

#### H. PROBLEMS OF TRANSITION TO COMPUTERIZED SERVICES (WORKING GROUP VI)

The introduction of computerization in information services provides many possibilities for improving information transfer, as well as for ultimately reducing costs. However, several problems must be overcome in the transition from manual to computerized services. These problems may be seen to be of two types: immediate problems of computerization and long-range adjustments necessary in the overall information system as a result of introduction of computerized information services.

In order to obtain maximum benefit at the national level from limited resources, the question of computerization of information services is often considered within the overall national information policy, especially in the developing countries. This approach typically involves coordination of hardware/software acquisition, computer use, training and deployment of manpower, etc., for the various computer applications in the information field. The development of national computerized databases and services is often given priority since these activities can directly enhance national bibliographic control, national information-handling capability, and possibilities for participation in international information exchange. Computerized information services based on foreign or international databases may effectively complement or partially supplant subscriptions to hard-copy secondary services in priority subject areas.



International cooperative information systems have helped provide a framework for the introduction of computerized techniques at the national and regional levels, in a gradual manner ensuring system intercompatibility. International systems such as AGRIS and INIS are typically established on the "territorial formula" of decentralized input and centralized output. Sponsoring international agencies provide guidance for modernization of information-handling techniques of participating centres, enabling an ever greater number to provide input in machine-readable form. Output can be decentralized as appropriate infrastructure is built up in participating centres, to enable specialized information services based on periodic tapes or ultimately on on-line links to a central file. The success of AGRINTER in Latin America and the Caribbean within the AGRIS framework provides an example of the benefits of such international cooperation.

Whatever type of information service is being considered, computerization is generally introduced only after attainment of a basic manual information-handling capability and following careful by the authorities concerned. Two basic types of information infrastructure are required:

- existing documentation facilities in the fields of information concerned, including experienced manpower and effective document delivery services;
- access to appropriate computer facilities and availability of specialized manpower in the computer field.

A feasibility study for the introduction of computerized services should fully examine:

- i. users needs for information;
- ii. the increased effectiveness (i.e. level of performance) to be attained by computerization, and if possible, the benefit of computerization in financial terms;
- iii. the cost of introducing computerized service, in terms of both initial investment and recurring expenses;
- iv. the means of financing and managing the computerized service, assuming that its value is clearly established.

Based on the needs of individual Member States, Unesco has accorded assistance for development of several types of computerized library and information services, with emphasis on the problems of transition from traditional services. The different aspects of this assistance have been reviewed in the previous sections of this document.

Computerization can also lead to significant stress on document delivery capabilities and on related services such as translation, eg. by making information services available to a wider audience, by improving the currency of the bibliographic references provided, or by increasing their number of their international character. At the national level, appropriate strengthening of infrastructures for acquisition, processing and delivery of documents should thus be foreseen when considering computerization of information services. The mechanism selected to obtain



this goal will depend on existing institutions, national information policy and the characteristics of the computerized services to be introduced, and cannot therefore be treated here in detail. Although aspects of Unesco support for infrastructure development have already been stressed in Section B, it is of particular interest that a preliminary study on models for national interlending systems has been completed under contract to Unesco (14) and that further work relevant to the specific problem of document delivery is under consideration, eg. within the programme for Universal Availability of Publications, being planned by IFLA in collaboration with Unesco.



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