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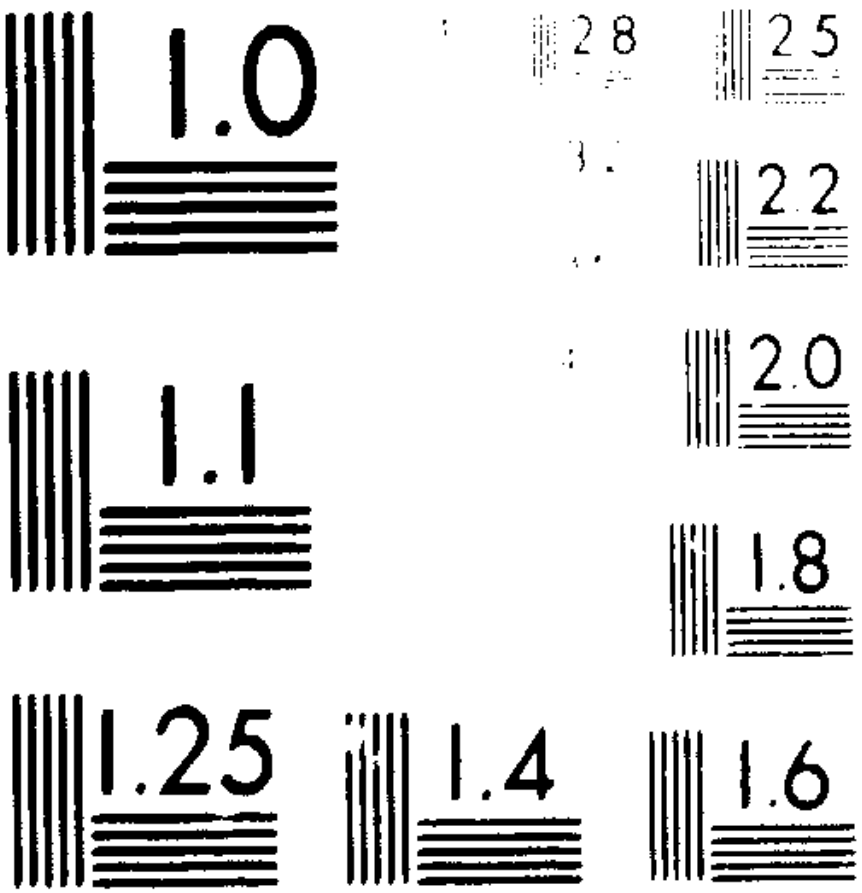
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DEVELOPMENT OF AN INDUSTRIAL INFORMATION CENTRE AT THE FEDERAL INSTITUTE OF INDUSTRIAL RESEARCH OSHODI, LAGOS

DP/NIR/75/069/11-02/C/31.3.B

NIGERIA.

Technical report: Development of Computer Use in the Industrial Information Centre

Prepared for the Government of Nigeria
by the United Nations Industrial Development Organization
Executing Agency for the United Nations Development Programme

Based on the work of
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Expert in Computerized Information and Documentation Systems

United Nations Industrial Development Organization
Vienna

Abstract

Within the set of reports on the UNIDO project of developing an Industrial Information Centre at the Federal Institute of Industrial Research, Oshodi (FIIRO), this report deals with all computerization aspects.

During the three-month mission the consultant contacted many organizations, computer companies, Nigerian experts, other UNIDO experts, and also UNESCO personnel, so that he could adapt his advice to the local circumstances. Advice and assistance was given in the development of SDI services on available computers, in making all necessary preparations for on-line access to international data bases, and in using a micro-computer at the University of Lagos.

To gradually build up full-scale operations, FIIRO will need its own minicomputer with an integrated set of software packages to perform

- retrospective on-line searches (dialog mode)
- SDI services (batch operation), including the necessary reformatting of magnetic tapes
- thesaurus administration for generic search capabilities (hierarchically structured vocabulary), control of synonyms, spelling variations and homonyms, and for the suggestion of related terms to the user for possible search expansion
- generation of printed outputs, e.g. FIIRO Industrial Information Abstracts, alphabetical indexes, specialized bibliographies, directories, etc.
- library routines (not mandatory, but helpful if available).

In deciding, which of the available software / hardware combinations to select, factors such as national and international cooperation, local computer support, especially hardware maintenance, and costs have to be considered. Alternative solutions are shown and recommendations are made.

An important part of the mission was training. Aside from informal, on-the-job training, a one-week training course was conducted.

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Explanatory Notes

Currency: ₦1.00 (one Naira) = US $1.57 in February 1982

Acronyms, Abbreviations, etc:

ACP-EC	Africa-Caribbean-Pacific - European Community (Convention of Lome), Centre for Industrial Development, Rue de l'Industrie 28, 1040 Bruselles.
BLAISE	British Library Automated Information Service.
CAB	Commonwealth Agricultural Bureau, Fanham Royal, GB.
CAN/OLE	Canadian On-Line Enquiry (CISTI)
CAN/SDI	Canadian SDI
CDS/ISIS	Unesco's Computerized Documentation System/ISIS
CIIS	Computer-based Industrial Information System, FIIRO.
CISTI	Canada Institute of Scientific and Technical Information, NRC, Ottawa.
COMPENDEX	Magnetic Tape version of Engineering Index, New York.
DOS	Disk Operating System (of a computer)
ESA-IRS	European Space Agency - Information Retrieval Service, Paris and Frascati (Rome)
Euronet	Telecommunications network in Europe for reliable, rapid and cheap data transmission using packet switching
Euronet DIANE	Direct Information Access Network for Europe
FSTA	Food Science and Technology Abstracts, IFIS
FIIRO	Federal Institute of Industrial Research, Oshodi (All Federal Research Institutes are under the auspices of the Federal Ministry of Science and Technology, therefore, FIIRO is not attached to the Federal Ministry of Industry).
Green revolution	Ongoing programme of the Nigerian Federal Government.
IDRC	(Canadian) International Development Research Centre, Ottawa. Regional offices in Africa, Asia, Latin America and Mid East.
IFIS	International Food Information Service, Frankfurt.
IITA	International Institute for Tropical Agriculture, Ibadan, Nigeria.

INSPEC	International Information Services for the Physics and Engineering Communities, London.
ILO	International Labour Office, Geneva.
ISIS	Integrated Set of Information Systems, a generalized information storage and retrieval system with particular emphasis on bibliographic applications, developed by ILO and Unesco (CDS/ISIS).
MINISIS	Software belonging to the ISIS family of systems for use on Hewlett-Packard minicomputers, developed by IDRC, from 1975 on.
NET	Nigerian External Telecommunications, Ltd.
NRC	National Research Council (Canada), Ottawa.
NSTDA	National Science and Technology Development Authority. Forerunner of the Federal Ministry of Science and Technology.
OAU	Organisation of African Unity.
OS	Operating System (of a computer)
PADIS	Pan African Documentation and Information System (a UNECA-OAU project, with assistance from IDRC).
SDI	Selective Dissemination of Information .
UNECA	United Nations Economic Commission for Africa.
UNILAG	University of Lagos.

Development of Computer Use in the Industrial Information Centre

I. INTRODUCTION

The UNIDO project for developing an Industrial Information Centre at the Federal Institute of Industrial Research, Oshodi (FIIRO), Lagos, has been going on since 1978. It included two missions of Mr. S. Parthasarathy, UNIDO Senior Industrial Information Expert, and one three-month UNIDO mission each of an Expert in Reprography (Mr. J. K. Kalyanam) an Expert in Industrial Training, (Dr. P. Lazar) and, presently, an Expert in Computerized Information and Documentation Systems (Computer Programming). With this mission the present phase of the project ends.

Within the project, UNIDO also funded several international fellowships for training local staff. Computer use was not a major aspect of this training abroad. Now that a programmer (computer science graduate) is on FIIRO's staff since July 1981, this aspect will also be emphasised.

The objectives of the present project (see Job description, Annex 1) are to assist FIIRO in developing and efficiently operating its Industrial Information Centre, in particular by gradually making use of the possibilities offered by computers (mission objective).

The mission was successfully carried through from Mid-November 1981 to Mid-February 1982, in close co-operation and consultation with Dr. O. A. Koleoso, Director of FIIRO, Mr. R. O. Sodipe, Assistant Chief Research Officer, in charge of the Information and Documentation Programme of FIIRO, and their staff.

On-the-job training was given to a few members of the FIIRO staff, and a one-week formal training course on Computerized Information and Documentation Systems was held from 18 - 22 January 1982.

2. PROGRAMME OF WORK

A programme of work (Annex 2) was drawn up at the beginning of the mission. It was approved both by the Director of Research, FIIRO, and UNIDO. The three lines of activities, regarding computerization, are:

- Assistance
- Training
- Planning.

3. STAFF DEVELOPMENT

A list of the counterpart staff available for the project is given in Annex 3. Mr. Adenaike, who recently got his master's degree in information science at the City University, London, joined FIIRO in January 1982. His past experience was at the Library and Documentation Centre of the International Institute of Tropical Agriculture, Ibadan.

3.1 Computer Personnel

Of the two persons selected in 1981 for computer processing (see S. Parthasarathy's Terminal Report of 10 July, 1981 p.2), only one, Mr. Ezeiyi, could be secured. Truly qualified computer personnel are offered higher salaries in the private sector. However, the security offered by a government or parastatal position may offset this to some extent. (There are instances where small private firms have not paid their computer personnel for many months, stating that they did not make any sales). Training opportunities, possibly abroad, are offered both in the private and government sectors. They are a major factor in recruiting computer personnel. Contracts should stipulate that the trainee does not leave the organisation for a certain period after receiving such training.

Much care has to be taken in recruiting computer personnel.[1] It is quite difficult to assess the capabilities of a programmer, especially if the recruiter is not a computer professional himself. It may be advisable to engage the services of a computer consultant for personnel selection. Some organisations use tests to screen candidates. A University degree in computer science is not a necessity. Cases were reported to the consultant where

1) see reference Chandor 1976 in Annex 11

Nigerian programmers without a university background performed very much better than computer science graduates. Performing well in a team of professionals may also be easier for some programmers than having to design everything alone without much expert help and guidance.

3.2 Training abroad

Training abroad under the UNIDO country programme has continued along the lines set out in Mr. Parthasarathy's report. Mrs. Aduwo attended the course "Patent Documentation as a Source of Technological Information" in Vienna from 19.8. to 18.9, 1981. Training at the Canada Institute of Scientific and Technical Information is being arranged for Miss Glover under the UNIDO fellowship in 1982. Arrangements for attachment training at Technonet Asia, Singapore have not yet been made, but are still planned.

The training abroad has been very useful for the development of the Industrial Information Centre and should be continued and intensified, especially in relation to computerization efforts.

It would be very useful, if Mr. Ezeiyi and Mr. Adenaike could attend courses and meetings on MINISIS and CAN/SDI which are conducted by UNESCO, in collaboration with the Canadian IDRC. (Contact UNESCO, Attn. Mr. G. del Bigio, 7 Place de Fontenay, Paris 75007, France). The courses of one or two weeks duration are conducted on a regular basis, usually in Paris, while the MINISIS user group meetings may be held at various places, where a MINISIS system is installed, e.g. at ILO in Geneva. Arrangements should be made to combine the attendance at such courses and meetings with attachment training of at least 2 months at computerized documentation centres using systems such as MINISIS and CAN/SDI or where the FSTA data base and tapes are used to a significant extent. The four institutions collaborating in the International Food Information Service are based in Wageningen (Netherlands), Farnham Royal (Bucks., U.K., CAB), Chicago (Institute of Food Technologists) and Frankfurt (Gesellschaft fuer Information und Dokumentation). The office in Frankfurt has its data processing done in Berlin, Hamburg and Cologne.

4 COMPUTERIZED INFORMATION SERVICES

4.1 SDI Services

The manual SDI service, started earlier in the project, has not been a full success. About 15 profile forms had been filled in by FIIRO scientists working in the area of food science and technology. Mr. Shittu and Miss Glover wrote out FSTA references manually and sent them to the scientists. It proved difficult to do this on a current basis for all profiles. Some of the profiles are too general. More experience in designing adequate profiles is required.

In a few training sessions a number of the profiles were redesigned according to the CAN/SDI Profile Design Manual, in cooperation with the scientists concerned. As neither the FSTA Thesaurus (1977, loose leaf, CAB, U.K.) nor the Food Multilingual Thesaurus (IFIS, Frankfurt) were available, the last annual index of FSTA was used as a vocabulary guide.

These and similar profiles can be sent to IFIS, Frankfurt, who offered to process a limited number of profiles free, (until FIIRO is ready to search the magnetic tapes) instead of sending the tapes. The tapes are sent free to developing countries only for a limited period of 1 or 2 years, with the condition that semi-annual reports on their use are submitted to IFIS.

CAN/SDI programmes were installed on the University of Ife's IBM 370/135 computer by UNESCO in 1979 or 1980 (see also Annex 5). It was planned to run an SDI service with COMPENDEX, INSPEC and FSTA tapes. Due to various circumstances (the man in charge left for another assignment, etc).the project never really got under way. An agreement was made to reactivate this project with the FSTA tapes now being received by FIIRO. The CAN/SDI System Manual (Ottawa, May 1976), available in Ife, was copied for FIIRO's use. It contains sections 'Reformat INSPEC Tapes' and 'Reformat an Engineering Index (COMPENDEX) Source Tape', but nothing on FSTA tapes. FSTA services were added to CAN/SDI in 1977. It could not be found out whether the CAN/SDI software, as installed in Ife, handles FSTA tapes or not. Aside from the 1976 CAN/SDI manual, the only other documentation on this project available in Ife were IBM manuals and manuals on a sorting system (Syncsort). Several FSTA tapes, addressed to NSTDA, 8 Strachan Street, Lagos, are in Ife.

At the Unesco office in Lagos (10, Okotie-Eboh Road, Ikoyi), information on Unesco activities in documentation and in computers could be obtained, but not on the Ife mission. A brochure that might be related to the project was available: Akande, Regional Databank on Technologies in Africa, 1st Progress Reports, NSTDA, September 1979. It was received from the Federal Ministry of Industries.

Two visits were made to Ife, the second one in February after we found out from DPMS Lagos (IBM distributor), that the tape drive spare parts had been delivered to Ife. However, the service engineer informed us that the tape drives still did not interact properly with the computer. At least arrangements could be made for a later use of the system by Mr. Ezeiyi of FIIRO.

If this project yields results, the following action should be taken:

- Inform Unesco, Paris (Attn. Mr. G. del Bigio), that their software has been used successfully.
- Ask Unesco, whether they would help to install a CAN/SDI system (if possible, running under DOS) on one of the IBM computers available in the Lagos area (Annex 5).
- Arrange for the use of one of these computers (IBM computers at universities seem to have more down time than those in the private sector).
- Arrange for training Mr. Ezeiyi to install the SDI system on the selected computer.

This course of action is more promising than trying to program an SDI system from scratch, e.g. on the CADO microcomputer at the UniLag Department of Computer Sciences. It might take years to arrive at an error-free program package that will work.

In the meantime, SDI profiles should be sent to IFIS, Germany, for free processing. After gaining some experience with this service, a few group profiles should be designed with queries of wide interest to Nigerian industry. The SDI printouts could be duplicated. The University Library, Ibadan, is already distributing such SDI group services in the area of medicine.

Another Institution making use of overseas SDI services by mail (IDRC) is the International Institute of Tropical Agriculture in Ibadan.

A listing of SDI postal services abroad of possible interest to Nigerian industry, e.g. BLAISE, ESA-IRS, Canadian and U.S. services, should be published (see section 8).

4.2 Accessing International Data Bases

4.2.1 Awareness

It is well understood in Nigeria that access to international data bases in North America, Europe and Japan would be very useful for industrial development, the Green Revolution etc. Even after having own computerized information systems, use of the large international data bases will have to be made, because only a portion of the data can economically be maintained in Nigeria's own systems. Nigerians are actively participating also in efforts to set up an African network of interlinked computerized information centres: PADIS, with headquarters in Addis Ababa and regional centres in Zaire, Niger, North Africa, etc. (Wilson O. Aiyepeku, Dep. of Library Studies, University of Ibadan, S. B. Aje and J. A. Dosunmu of the National Library).

4.2.2 External Data Communications

Engineer Y. A. A. Raji, Director of Engineering, Nigerian External Telecommunications Ltd., Lagos, gave a very informative paper "External Telecommunications (Present and Future) Facilities for Data Transmission" at FIIRO's training course on 22 January, 1982 to which reference might be made (FIIRO will publish the proceedings). Data transmission to London and other places is already going on for airline reservation systems, oil companies and other businesses. At present, it is possible to access Lockheed (presently the largest) and other information services by:

- telex (₦4.00 per minute, 50 bits per second)
- Switched telephone connexion (₦4.00 per minute, 300 or 1200 bits per second or more).
- leased telephone circuit.

T e l e x. Although too slow for the kind of dialogue that you want to have with the computer, Telex is for the time being probably the solution with the least problems. Per volume of traffic, it is several times as expensive as data transmission over a telephone line.

S w i t c h e d T e l e p h o n e. A portable or stationary data terminal is required (purchase price from US $ 2500 upwards) with a modem (a

few hundred dollars) or a built-in accoustic coupler. The problem in Nigeria is to get a connexion to NET and the often poor quality of such a connexion.. Long distance connexions from other states to NET in Lagos are even more problematic. Using a portable terminal at the premises of NET is one way of circumventing the problems associated with the switched internal P & T lines. Others are leased wires or radio links. However, solutions to the problems associated with switched connexions are technically possible and cheaper and should be worked on.

D a t a b o o t h. NET plans to install a data booth on its premises in the near future, much the same as telex booths are offered to the public. Use of this should be made as soon as it is available, to query Lockheed, Euronet DIANE etc. NET invites suggestions on the type of terminal to install.

L e a s e d t e l e p h o n e c i r c u i t. Leasing a single voice-grade international circuit (satelite transmission) is cheaper per unit of time, but the cost must be borne for the whole period of the lease, regardless of whether data is transmitted or not.

4.2.3 Packet Switching

Nigeria plans to build up a packet switching network in the time frame 1985-1990. If the African Satelite System (AFROSAT) is implemented, an AFRONET will become possible. In packet switching,you pay only for the volume data transmitted, regardless of the connect time. e.g. from a node installed in Kuwait by Itacable a typical 15 minute dialogue with the Lockheed computer in California will cost about US $5,-- for the satelite data transmission. No monthly or minimum charge is levied. Euronet also applies the packet switching technique.

4.2.4 Training

Organisations like ESA-IRS and Lockheed Information offer training seminars for using their data bases. An ESA seminar requires about half a year's advance request, while Lockheed is a little more flexible. An attempt was made to incorporate a hands-on Lockheed training session into FIIRO's January 1982 course. However, due mainly to delays or non-delivery of cables and letters, this did not materialise. It was not possible to establish a telex

connexion to Lockheed in Great Britain from the UNDP office in Lagos. FIIRO plans to offer a Lockheed seminar at a later date.

4.3 CIIS Pilot Project

Negotiations between FIIRO and the Department of Computer Science of the University of Lagos (UniLag) began during S. Parthasarathy's 1981 mission. An agreement was made on 1st September 1981 for a 6 month project "Computer-based Industrial Information System" (CIIS). UniLag shall, among other activities:

(a) design, program and implement an information bank covering information on current research projects, industries, machinery and equipment, abstracts published by the Library, institutional profiles etc.

(g) explore the possibilities of implementing the computerized SDI system.

Activities (b) to (f) are on formats, retrieval, manuals and other documentation, maintenance and training.

The consultant submitted an interim report on the CIIS project to UNIDO and the two parties on 2 December 1981. On this and other occasions he stressed that a file structure using inverted files is necessary, allowing search terms to be freely combined. This is not possible with the software developed so far. Other advice regarded adopting internationally accepted standard input formats, e.g. FSTA formats, as well as upper and lower case processing, for high quality or photo-typeset output.

The paper delivered by the project leader Dr. M. O. Afolabi of UniLag at the FIIRO training course on 19 January 1982 concentrates mainly on the menu technique used for man-machine dialogue and the forms design for people. These are, of course, important parts of such a design assignment and it is good if care is taken in their design at an early stage. However, there remains a long way to go if all the expectations of a C.I.I.S. are to be fulfilled. The two parties probably strongly underestimated the work and skills required for such a task. An idea of the complexities of such on-line retrieval systems can be gained by looking at literature like Valantin's 'Functional Analysis of MINISIS' or the section on error messages in the CAN/OLE User's Manual (Annex 9).

The computer used, the department's own CADO microcomputer (see Annex 5), offers on-line programming, data entry, interrogation and enquiry, which is not possible on-line with the UniLag Computer Centre's IBM 370/145.

The Computer is available full-time to FIIRO's programmer, Mr. Ezeiyi. The down-time of the computer is normally much less than with the large IBM computer. However, delays in getting spare parts can be about 2 months, due to import procedures.

The data that is entered in the design process is taken from "Directory of On-going Research Projects in Nigeria", FIIRO, March 1980, 408p. Only a few records have been entered. Entering data on any practical scale would require a keyboard operator (data typist). Similar directories could be compiled with the CADO system and updated regularly, even by just using the existing CADO oftware for word processing and file management. A correspondence quality printer would be necessary. Data would have to be entered in upper and lower case. (The printouts distributed during the demonstration on 20 January 1982 had upper case only).

Assistance and training was given to Mr. Ezeiyi as far as the short duration of the mission and the distance to the University of Lagos allowed (no telephone connexion was possible and transport was extremely time-consuming). Some literature for self-training was recommended.

Regarding SDI services with the CADO computer or UniLag's IBM computer, see section 4.1

A little more assistance would have been possible if the outstanding interim report had been available.

5 TRAINING

Informal training was given to FIIRO's staff during the whole duration of the mission on all aspects of computerization. Special attention was given to FIIRO's programmer on the design of programs and inputs and to the three staff members involved in the preparation of SDI profiles.

Formal training was organized for the week of 18 to 22 January 1982 (Annexes 6 and 7). The course fee was ₦300.00, and 28 participants signed up, in addition to 8 from FIIRO's I and D Programme and 3 from FIIRO's other Programmes. Course material from UNIDO, Euronet-DIANE, Lockheed and other organisations was distributed. The function was covered by radio and TV. FIIRO intends to publish about 500 copies of the Proceedings of this course.

Except for the lectures by P. B. Brahma and H. G. Koerner, all lectures were delivered by Nigerian experts. In general, the professional level of the lectures and discussions was quite high. The lively discussions reflected the strong interest taken by the participants.

Mr. B. Adenaike evaluated the course on the basis of a questionaire completed by the participants. The overall response was positive and encouraged FIIRO to conduct such courses including advanced courses on a regular basis.

6 PLANS FOR COMPUTERIZATION

6.1 Terminal for accessing data bases

6.1.1 Portable Terminal

A portable terminal could be taken to the premises of NET from time to time to conduct a number of searches in one session. Such terminals are similar in size and appearance to a portable typewriter, but have an acoustic coupler into which the telephone handset is placed (see annex 10). They cost from US $2,500 upwards and are offered by:

- Texas Instruments (Silent 700 electronic data terminals, e.g. model 785, see Annex 10).
- Sanyo, Japan
- Computer Devices Inc., USA and France, e.g. Miniterm 1206 portable computer and terminal system, programmable in BASIC (see Euronet DIANE News, No. 21, p.8).
- and possibly other manufacturers.

The T. I. Silent 700 and the Miniterm are widely used in Europe and North America. Texas Instruments has a distributor in Nigeria (see Annex 4), who has so far imported microcomputers but not portable terminals.

Portable terminals normally do not need much servicing. One solution is to send them to Europe if major servicing is required.

Searches via long distance calls to USA or Europe from FIIRO can also be tried with the same terminal. It would be necessary to have at least one to conduct a training seminar for the Lockheed Information Service or another overseas database host.

6.1.2 Telex

A Telex terminal was ordered in mid-1981 by FIIRO. The Centre for Industrial Development of ACP-EC in Bruxelles has offered to do data base searches for FIIRO. Queries and answers could be sent by telex. This would not require as much connect time as searching data bases by telex directly, however the dialogue would have to be done by an intermediary.

6.1.3 Computer terminal

Most computer terminals can also serve as terminals to access external bibliographic data bases. The data can be transferred directly to one's

own computer.

6.2 Computerization within the National Framework

A computer for the Industrial Information System would have to fit into the overall picture of computerized information and documentation in Nigeria.

6.2.1 The Nigerian Situation

There are over 200 computers in Nigeria, not counting the microcomputers (see Annex 4). None of these is used for bibliographic data bases (documentation work), to the consultants knowledge. The only related applications are the batch processing of a Union List of Serials at the University of Ibadan (see Annex 6, Aramide, 21-1-1982), and the work on Union Catalogues and on the National Bibliography that has been started at the National Library.

A few research centres that have a computer are showing interest in using it for information and documentation, e.g. IITA (DEC PDP 11/70) and the Nigerian Institute for Oilpalm Research, Benin City (a small IBM computer). The Central Bank, where two DEC PDP computers are installed, also has a large and important research library (Oguara 1975, annex 11).

Other libraries and information units are interested in installing a small computer specifically for their needs, e.g. the Library of the Nigerian Institute of International Affairs.

6.2.2 Educational Information System

Unesco has been giving consultancy support to the Federal Ministry of Education (e.g. missions of L.R. Fermig), particularly in the area of Educational Information and Documentation. From 27 to 31 January 1981 the Ministry organized a National Seminar on Educational Information Systems in Nigeria, in Kaduna. The participants presented a number of unanimous recommendations, the first of which reads as follows:

"A national network for an educational information system in Nigeria should be established by law on the principle of a centralized-decentralized approach. This should be conceived within the framework for a National Information System that will include science and technology, agriculture, medicine, social science and humanities, information, National Library of Nigeria and National Archives. Each of these sub-systems should be autonomous and independent, compatible with the others and linked to them in a distributed network structure which would

form the National Information System".

Other recommendations contain details such as:

- a National Documentation Centre for Educational Information
- data bank with on-line acess
- funds for terminals, mini-computers
- project on standards for manual and machine data gathering
- development of SDI
- preparation of a Nigerian Education Thesaurus
- publication of the seminar papers.

At present there is an Educational Information and Documentation Centre in the Ministry. No computer is used yet.

6.2.3 NIDOC

The National Library plans a seminar on National Documentation in 1982 and will then launch NIDOC and with it a national system of information input/output service. The system will be a node in PADIS. For several reasons the National Library would like to use the MINISIS software, which is available only for Hewlett-Packard 3000 computers (see Introduction in Valantin 1981, Annex 11, see also p.3). One of the reasons is that the PADIS centre and established subcentres are using the MINISIS-HP3000 combination. Hewlett-Packard does not market or service computers in Nigeria. Therefore the National Library is negotiating with the French company Seric in Paris to service HP 3000 computers in Nigeria.

A network of several information systems using minicomputers is envisaged. The following areas are mentioned in J. A. Dosunmu's training course paper.

- Development Sciences
- Agriculture
- Education
- Science and Technology
- Medicine
- Law.

At present the National Library has an Inforex key-to-disk data preparation system and uses an IBM computer at the DPMS Data Centre.

6.2.4 Federal Ministry of Industries

The Nigerian Investment Information and Promotion Centre, Federal Ministry of Industries is building up an Industrial Data Bank. Here, also, a

mini-computer solution is being considered (posssibly ICL, Annex 4). The project is described by P. B. Brahma, UNIDO Senior Industrial Information Adviser, in his FIIRO training course lecture. (See also p.24-25 in "Nigerian Industrial Policy . . .", Annex 11).

6.2.5 Cooperation

All activities are still at such an early stage that cooperation can yield maximum benefits. Standardized formats for entry of bibliographic data, for thesaurus construction and maintenance etc. should be agreed upon to ensure the possibility of using the same or similar software. As the National Library is actively participating in international bodies with standardisation programmes, the application of such standards in Nigeria should not be difficult.

Regardless which institution will get its computer first, and whether it will be a Hewlett-Packard 3000 or another one, the work load will at first be low enough to allow the other institutions to participate in the use of the computer, Personnel could gain experience in the use of the computer and be ready when further computers are installed.

6.3 Software

The main criteria for selecting a computer for FIIRO are:

- the available software
- compatibility with National and Pan-African information and documentation centres.

6.3.1 MINISIS

On the first count alone the MINISIS software would be best suited for FIIRO's needs. This "integrated set of information systems" has all the features required (see R. L. Vakantin 1981 and J. Page 1981, Annex 11). The only drawback is the difficult maintenance of the necessary Hewlett-Packard 3000 computer, already mentioned in section 6.2.3. A computer consulting firm pointed out the possibility of third party maintenance in Nigeria. The most vulnerable spare parts could be stocked by FIIRO. A service engineer would have to be sent to Hewlett-Packard for training. Section 7 will contain some information on how the maintenance problems are tackled in other Black African countries.

6.3.2 Compatibility

A certain degree of compatibility can be achieved between different computers and different software packages. Hence other software than MINISIS should also be considered, especially in view of hardware maintenance advantages.

6.3.3. DOMESTIC

The DOMESTIC software is described in a paper by Omer and Branse 1981, which is almost identical to the paper by Omer and Seelbach in GID 1981 (Annex 11). There have been contacts between the development teams of MINISIS and DOMESTIC for many years (meetings in Tel Aviv 1976, Ottawa 1980 and Frankfurt 1981). DOMESTIC is programmed in FORTRAN and Assembler, and runs on a Philips P 857M minicomputer in Germany and on a DEC PDP11/70 midicomputer in Israel. The PDP 11/70 is a somewhat larger and costlier computer than the HP 3000. The Philips P 857 M is not a widely used minicomputer.

The features of DOMESTIC are largely comparable to those of MINISIS. (Friendly command language, thesaurus administration, information retrieval, SDI, library automation, print generator, etc.). It is only installed twice in Germany and once in Israel, to the consultants knowledge. The price quoted is several times as high as the US $30,000, for which MINISIS is being marketed in Europe.

6.3.4 MIDONAS 80

MIDONAS 80 was developed by the Swiss Department of Defence in Bern. It runs on a PDP 11/34, a smaller minicomputer than the HP 3000. Another installation is at a Frankfurt bank. It has nearly all the features of the two above mentioned systems, including thesaurus administration.

The consultant wrote to Bern on 21-1-1982, inquiring about the availability of MIDONAS 80.

6.3.5 STATUS

STATUS was developed at the Atomic Energy Research Establishment, Harwell, Computer Sciences and Systems Division and is being marketed by AERE Harwell's Marketing and Sales Department (Oxfordshire OX 11 ORA) and a group of franchise holders, including Systems Designers Ltd (DEC and IBM) and ICL Dataskil (ICL). It will run on a wide variety of computers and has been implemented,

among others, on

- ICL 2900 series, including 2904
- IBM 370 (TSO and CICS)
- DEC PDP 11 Series
- Prime 300 and 400
- Burroughs B4700

It includes a Thesaurus processor, SDI, report generator etc.

FIIRO should contact AERE to obtain the latest information, especially on availability for Nigeria.

6.3.6 Other Software

On page 145 of GID 1981 (Annex 11) there is a list of 11 minicomputer-based storage and retrieval systems, which includes the 4 systems described above. We have selected these 4 systems on the basis of relevance for Nigeria, especially regarding the hardware aspect. A fifth system, CAIRS, of the Leatherhead Food R.A., England, running on a Texas Instruments computer, might also be looked into. However, Texas Instruments computers are not among those backed by a distributor servicing more than 30 installations. No information was available on CAIRS.

6.3.7 Software Costs

Costs of developing one's own software from scratch can easily run into the range of over a million dollars. Rental of appropriate software for large computers can cost more than $1,000 per month. Purchase of the software for small computers may cost $10,000, $30,000 or more. MINISIS is provided free to developing countries. However, saving about $30,000 should not weigh too heavily against other factors such as hardware maintenance.

6.4 Hardware

6.4.1 Computer

On the basis of software availability, the following computers are in consideration:

- HP 3000
- PDP 11/70
- smaller PDP 11's, e.g. PDP 11/24 or PDP 11/34 or PDP 11/44

- ICL minicomputers.

Regarding servicing and support in Nigeria, ICL and DEC (PDP) may be regarded as comparable. Both have in the range of 40 computers in the country and servicing is reported to be acceptable. Servicing a HP 3000 from Paris or through a third party is a venture with many uncertainties. The experience in Addis Ababa, Nairobi, Kinshasa and Zimbabwe has to be gathered and weighed.

Regarding the size of a PDP computer, the smaller PDP 11/24 would be able to cope with FIIRO's throughput for several years, even if additional work is put on the computer by other divisions of FIIRO (word processing, accounting, techno-economic programme, science and engineering). If necessary, the system can easily be upgraded within the PDP 11 family at a later date. A MIDONAS 80 system can probably be adopted to the PDP 11/24 too, although it was programmed for a PDP 11/34. DEC is phasing out the older PDP 11/34 and recommends the newer models 24 and 44. Large capacity disk drives can be handled by the smaller minicomputers also.

Independent and fair descriptions of the computers considered (and others) have been written by the Auerbach consulting organisation (Annex 11). This voluminous and very expensive loose-leaf publication is available at the University of Ife Computer Centre. Prices in US dollars are also listed.

Before deciding which minicomputer to program the MINISIS system on, careful comparisons and benchmark tests were done by the systems designer at IDRC, Fay Daneliuk. There were good reasons to choose the HP 3000 and not a member of the PDP 11 family. The consultant does not know, however, how much weight was given to the fact that DEC PDP computers are much more widely available and servicable in developing countries than HP 3000s.

6.4.2 Main Memory

The MINISIS system requires at least 256 kbytes of main memory. The installation of the Arab League in Tunis, for instance, will have 768 kbytes and 10 terminals.

The DOMESTIC system in Tel Aviv employs a 128k-word memory, although the applied programs don't use more than 64k (PDP computers work with a wordlength of 16 bits, whereas a byte has 8 bits). Larger memory will allow more terminals to be used simultaneously, e.g. 4 in Tel Aviv.

The MIDONAS 80 in Bern also uses a 128 k-word memory. 9 terminals are attached..

6.4.3 Disk Storage

The disk storage size depends on the file size. Typical values for disk storage are in the 50 to 500 M byte range. Bern reported 40 M bytes in 1974 and 372 M bytes in 1980. Usually, removable disk packs are used. They are very sensitive to dusty environments (possibility of a head crash). The more rugged encapsulated Winchester-type hard disk drives are fixed and of lower capacity, too low for full-scale operations of national industrial information service. Floppy disks have yet lower capacity, but are removable. They are used on the FIIRO/UniLag CIIS project.

6.4.4 Other Peripherals

A telecommunications modem has been mentioned in section 6.1.

A tape drive is required for SDI services, data exchange, etc. Two would be advantageous.

One terminal should be available for the operator/programmer, one or more for data entry, and one for queries etc. Additional terminals may be useful for word processing and other applications.

Besides a normal matrix or line printer, a correspondence quality printer of slower speed would be useful for printing directories, lists, and word processing outputs. Linkage to photo-typesetting equipment should also be considered.

6.4.5 Hardware Costs

The US dollar prices for computers and all peripherals can be calculated from the prices listed in the aforementioned Auerbach Data World. A satisfactory HP 3000 configuration would cost from $100,000 upwards, depending on which basic system is selected:

	Price in US $
HP 3000 Series 30 with 256 k bytes	28,525
series 33 with 256 k bytes	37,275
series III with 256 k bytes	78,875

The best suited configuration should be discussed with IDRC, if the MINISIS solution is decided on.

Nigerian computer prices are much higher than those in the USA, due "to the high cost of doing business in this country" as a Nigerian computer salesman put it. An import duty of 42% is levied. A typical PDP 11/24 configuration may cost over ₦200,000.

Site preparation costs, the costs of a generator and a standby generator that would constantly be used to avoid the power failures and voltage deviations of more than ± 20%, etc. would have to be added to arrive at the total costs (see, however, the last paragraph on page 25).

7 INFORMATION OBTAINED AT PADIS

The consultant visited PADIS in Addis Ababa on two days at the end of his mission with the aim of finalizing his recommendations regarding the most suitable software/hardware combination for the Nigerian Industrial Information Centre. The issue is whether to install a HP 3000 computer, as used at PADIS and at several other African documentation centres, or a computer out of the PDP 11 series, which is backed by a distributor and service company already supporting over 30 installations in Nigeria.

One of the users of a PDP 11/34 is the Nigerian Ports Authority, where the system was introduced by the Hamburg Port Consultants. These consultants found it necessary to have their own expatriate hardware engineer in Nigeria. One of the reasons is to ensure correct failure diagnosis. Incorrect diagnosis may lead to waiting for spare parts for two months only to find out that the failure cannot be aleviated by the envisaged measure.

The HP 3000 at PADIS (Series III, 2 Mbyte main memory, 20 Terminals) has never been down since its installation in January 1980, apart from normal preventive maintenance of the disk drives, requiring about 4 to 5 hours at intervalls of two months or more. It is used from 7:30 to 20:30 daily. As use of the system has increased and diversified into statistics, administration, etc, MINISIS is no longer carrying the main workload. The system will be upgraded to a series 44 with 4 Mbyte main memory and 64 Terminals in the near future. Maintenance of the tape drives and printers can be done during uptime. A service engineer, who also helps users with software problems, is on site fulltime, except when he services the second HP 3000 in Addis Ababa at the International Livestock Centre for Africa (Mr. Mukuna of Zaire, who was trained in Paris and speaks French and English). The HP 3000 diagnostic program is at hand so that it can be

used when need arises. It has only been used twice, mainly to gain experience, without any actual need. There is a small spare parts stock with circuit boards, air filters for the disk drives, etc.

SERIC (Société d'études de réalisations informatiques et de conseil), 120 Rue de Javel, 75015 Paris, is a Hewlett-Packard distributor for France and for the whole of Africa. It has subsidiaries in Belgium, Zaire, Cameroun, Tunisia, Kenya, and associated organizations in Congo, Marocco, Ethiopia and the Ivory Coast. SERIC tries to recruit personnel from the region where they will be servicing HP computers and trains them in France. There should be no difficulty in assigning an English-speaking service engineer to Nigeria. He would be on SERIC's staff, stationed fulltime at the computer installation. The maximum cost of this service is 1.5% of the pruchase price per month. It will be less if several HP computers are installed in Nigeria.

From th information obtained at PADIS, the consultant strongly recommends the MINISIS/HP 3000 solution with SERIC responsible for hardware and software support. A further reason for this recommendation is the high pace at which ECA is implementing PADIS. An early linkage of FIIRO's Industrial Information System, e.g. by using the same formats, by exchange of magnetic tapes etc., would be of mutual advantage. Computer generated publications could be computer typeset at IDRC or elsewhere as is now being done with the DEVINDEX Africa, published by ECA-PADIS.

New models of HP 3000 computersare available since November 19t . (Series 40, 44 and 64). An offer for a HP 3000 Series 44 system (minimum memory size for the Series 44 is 1 Mbyte) for Nigeria had been prepared by SERIC before the consultants arrival in Addis Ababa. It has been forwarded to FIIRO. For FIIRO a Series 40 system (memory sizes range from 256 kbytes to 2 kbytes) would suffice during the first few years, even considering further applications of the computer by other divisions of FIIRO. It could be upgraded to a Series 44 when need arrises. This is done by exchanging and adding a few circuit and memory boards. The offer does not include a daisy wheel printer, which the consultant recommends for word processing and preparation of publications.

The HP 3000 computers have rechargeable battery packs to maintain memory data during power failure. In Addis Ababa no generator is required, only a voltage stabilizer.

8 RECOMMENDATIONS

1. The Government should give the necessary priority to the development of a Computerized Industrial Information System (CIIS) at FIIRO. Small, medium, and large scale industries, as well as researchers, administrators, businessmen, consultants and others will benefit considerably by being able to tap the world's knowledge in all fields of technology, science, business information, etc.

2. Within the UNDP Country Programme a priority should be given to the development of the national industrial information centre as a centre that is prepared and able to computerize many of its operations and thereby make its services effective, fast, comprehensive, exact and up-to-date, as would never be possible with manual methods. This is a computer application that will not take away jobs. Rather, improving information services will increase the demand for such services.

3. Further UNDP/UNIDO consultancy assistance should include a sufficient portion of computer expertise, specialized in information and documentation systems. Current assistance is required for two on-going projects that use outside computers (University of Ife for SDI services on an IBM 370; University of Lagos on a CADO microcomputer, to build up files that can later be transferred to FIIRO's computer). Three missions of 1 to 2 months per year are necessary for this and to further assist in all preparations for FIIRO's own minicomputer. Beginning one week before installation of the minicomputer, assistance would be required for 1 year. After that, assistance could be reduced to 6,4,2, and 1 man-month per year. In case of limited UNDP funds, the Government should share the costs.

4. A minicomputer system should be installed at FIIRO for its CIIS with a minimum of 256k bytes of main memory and the necessary peripherals (disk and tape drives, terminals, printers, tele-communications modem). The type of the minicomputer (Manufacturer and model) must be determined by the software package that is to be the backbone of the whole Computerized Industrial Information System.

5. FIIRO should get one of the available tested and proven software packages, which have been designed after much experience with preceding systems. It is not possible nor economical to assemble the necessary expertise within the country to program such a complex on-line system involving a whole set of sub-systems. Enough programming remains to be done before and after such a system has been acquired.

6. FIIRO should cooperate with the National Library, PADIS, and other institutions in making the final decision, which software/hardware combination to acquire. With all the information presently at hand, the UNIDO consultant recommends the MINISIS software with a Hewlett-Packard 3000 minicomputer.

7. FIIRO should also acquire a portable terminal for accessing international data bases. In view of the high data transmission costs a terminal would be advantageous that can store log-on instructions and search statements for quick start-up of the dialog (see Euronet DIANE News, e.g. No. 22, p.6).

8. FIIRO should continue and intensify its work of producing printed reference tools containing information for industry and for industry-related research. As a by-product of typing such directories etc., machine-readable records should be produced for later storage in the computer. Three possibilities might be utilized: (1) the CADO microcomputer of UNILAG, (2) an OCR-B ball head (optical character recognition-character set B) for the existing IBM electric typewriter, and (3) a small word processor with floppy disks, in case FIIRO acquires one before getting the minicomputer. Linkage with photo-typesetting should be looked into.

9. To assist the programmer in building up computerized files, FIIRO should hire a data-typist or have the work done on a cost per effor-free record basis.

10. UNIDO should provide further assistance for training FIIRO staff abroad, especially those staff members who are strongly involved in the computerization efforts.

11. FIIRO should approach UNESCO through the official channels to request assistance in reactivating an SDI-service project for Nigeria, using CAN/SDI software on available IBM computers. The assistance should include training of FIIRO personnel for CAN/SDI and later for minicomputer-SDI.

Annex 1

UNITED NATIONS

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO 4 August 1978

PROJECT IN THE FEDERAL REPUBLIC OF NIGERIA

INTERNAL

JOB DESCRIPTION

DP/NIR/75/069/11-02/C/31.3.B

JOB TITLE	Expert in Computer Programming
DURATION	Three months
DATE REQUIRED	October 1978
DUTY STATION	Lagos; with travel within the country.
DUTIES	The expert will specifically be expected to: 1. Organize and develop computerized information services and data bank. 2. Provide training to the local staff in programming and preparation of inputs for data bank. 3. Draw up plans for augmenting the facilities. The expert will also be expected to prepare a final report, setting out the findings of his mission and his recommendations to the Government on further action which might be taken.
QUALIFICATIONS	Academic background with experience in organizing and operating computerized information systems and services, especially SDI service. Knowledge of programming languages: Cobol, PL/1, Assembler, etc.
LANGUAGE	English

..../..

BACKGROUND INFORMATION

The Federal Institute of Industrial Research (FIIRO), Oshodi, Lagos, shall be responsible for the project. FIIRO is a research institute of the National Science and Technology Development Agency of the Federal Government.

The FIIRO has five divisions, the Industrial Analysis Division, Food Science and Technology Division, Engineering Division and Administrative Division. It has a total staff of about 250, one-fifth of which are in the professional status. Facilities are available for research in the areas of Food Science and Technology, Industrial Chemistry, Industrial Economics, Marketing and Business Management.

The members of the project will work with the Industrial Analysis Division which is responsible, among others, for the operation of the library and documentation centre.

Presently FIIRO operates a small library and a modest documentation centre staffed by two Nigerian professionals experienced in library work. It has also some reprographic facilities and a small photo-offset printing unit for printing publications issued by the Institute. In addition, there is a mini-computer for accounting purposes, operated by a programmer. For computerized information services, the computer facilities available in Lagos will be used.

To assist FIIRO in the establishment and in the efficient operation of its Industrial Information Centre, the services of experts and fellowship grants will be provided by the project.

NO CANDIDATES REQUIRED AT THIS TIME

Annex 2

UNIDO PROJECT ON INDUSTRIAL INFORMATION

Proposed Programme of Work

23.11.81 - 11.2.82

by

Horst G. Koerner
UNIDO Consultant for Computerized
information and documentation systems.

DP/NIR/75/069/11-02/C

I plan to follow several lines of activities during the duration of my mission:

1. Assist FIIRO in organizing and developing computerized information services and a data bank.

   a. Reactivate efforts made in the past by other Nigerian institutions to utilize magnetic tapes for SDI services, especially Food Science and Technology abstracts tapes.

   b. Put into motion the arrangements for being able to query foreign data banks via satelite data communication on a regular basis, especailly those accessible over Euronet as well as U.S. based services, such as Lockheed.

   c. Give advice on the pilot project CIIS (Computer-based Industrial Information System), being carried out by the Department of Computer Sciences, University of Lagos, under contract for FIIRO since September 1981, using the Department's microcomputer.

2. Training

   a. Provide training to FIIRO's staff in developing and using computerized information services.

   b. Assist in setting up the course programme for a one-week training course in computerized information and documentation systems, to be held in January 18 - 22, 1982 at the University of Lagos.

   c. Prepare and give 3 lectures for this course.

3. Plans for augmenting facilities in connection with computerization.

   a. Make recommendations for purchasing a suitable terminal for accessing foreign data banks.
   b. Get an overview over mini- and microcomputers and magnetic storage devices available and serviceable in Nigeria which would be suitable for the planned computer installation at FIIRO.
   c. Draw up plans for this installation.

4. Reports and written recommendations.

   a. Write interim reports with some recommendations to enable early discussion of upcoming issues.
   b. Write final report with recommendations to the Government on further action which might be taken.

I seek your approval for the above proposals.

H. Koerner
4 December, 1981.

Dr. O. A. Koleoso
Director of Research, FIIRO.

Annex 3

COUNTERPART STAFF

	Function	With I & D Division of FIIRO since:
Mr. R. O. Sodipe Assistant Chief Research Officer	Overall management of Information & Documentation Programme (formerly I&D Division) Development of industrial information services. Development of regular training course in industrial information Publishing Technical Information Bulletin for Industries. Editing FIIRO publications	1972
Mr. B. O. Adenaike Principal Research Officer	Assist Mr. Sodipe in all functions. Design of CAN/SDI profiles	Jan. 1982
Mrs. M. A. Aduwo Senior Research Officer.	Preparing and publishing FIIRO Industrial Abstracts.	1980
Mr. R. U. Ononogbo Senior Research Officer	On study leave for Ph.D in library science at Loughborough Univ., U.K., since 1980.	1978
Mr. C. J. Ezeiyi Senior Research Officer.	Development of computer software for information and documentation, running SDI service on external computer.	1981
Miss O. Glover Research Officer I	Information storage and retrieval, indexing, technical inquiry service, current awareness service, manual SDI service, design of CAN/SDI profiles.	1980
Mrs. E. O. Onabanjo Senior Technical Officer	General library administration, photocopying service, loan service, shelf maintenance.	1978
Mr. A. Shittu Senior Technical Officer	Information storage and retrieval, indexing, technical inquiry service, current awareness service, manual SDI service, design of CAN/SDI profiles.	1978

Annex 3

COUNTERPART STAFF

	Function	With I & D Division of FIIRO since:
Miss P. Ozuluonye Higher Technical Officer	Acquisition and processing of books, periodicals, reprints, etc.	1979
Mrs. M. Babatunde Technical Officer	Assist in acquisition work	1978
Mrs. C. Aluko Asst. Technical Officer	Assist in information processing, computer work.	1981

Annex 4

COMPUTERS AVAIALBLE IN NIGERIA

Computer Vendors in Nigeria:		Computers:
The 4 major companies (each having sold at least 30 computers, not counting micro-computers):		
-	DPMS (Data Processing Maintenance & Services Ltd., formerly IBM), Lapal House, 217-235, Igbosere Road, Lagos. P. O. Box 1083, Tel. 633969, 633869, 633848.	IBM (multi-national).
7*	ICL International Computers (Nigeria) Ltd., ICL House, 178 Awolowo Road, Ikoyi, P. O. Box 2134, Lagos. Tel. 684757, 684754.	ICL (U.K.).
1	Data Sciences Nig. Ltd. (formerly Earth Sciences Ltd.) 2, Ola-Ayinde Street, Ikeja, Lagos. P. O. Box 6352, Lagos. Tel. 935116.	DEC (PDP) Digital Equip-ment Corp. (U.S.A.) Inforex (USA) (also Racal-Milgo Data Communications Systems).
	NCR (Nigeria) Ltd., Lagos. P. O. Box 509	NCR (U.S.A.).
Companies with considerably lower computer sales volume:		
59	Comsoft Data systems Ltd. 7, Chief Onitana Street P. O. Box 4430, Surulere. Tel. 830318.	T. I. Texas Instruments, (U.S.A.)
-	Data Systems Nigeria Ltd 39 Bode Thomas Street Surulere, Lagos. P. O. Box 50977, Ikoyi. Tel. 833963.	CADO Systems (U.S.A.).
58	Datamatics Co. (Nig.) Ltd. 3, Iya Oloye Crescent P. O. Box 864, Ikeja, Lagos. Tel. 960417.	Wang (USA).
54.	Debis (Nigeria) Ltd., 134, Obafemi Awolowo Way P.M.B. 21464, Ikeja, Lagos.	Perkin-Elmer (USA) Apple (USA)
-	Haven Nigeria Computer Co. Ltd., Hamburg House, 31/33 Martins St., Lagos. P. O. Box 4034. Tel. 636651.	CMC (USA).

COMPUTERS AVAILABLE IN NIGERIA

9*	Joint Komputer Kompany Ltd., 21, Ondo Street Bodija Estate, Ibadan Tel. 410356 and 39 Abeokuta Street Ebute-metta, Lagos. Tel. 863525.	Data General (USA).
4	Leventis Technical Ltd Iddo House Lagos Tel. 800220 Ext. 223	Olivetti (Italy)
-	Standard Computer Systems** Lucina Joseph Street Box 2315, Surulere - Lagos.	Ohio Scientific (USA)
-	Universal Computers, P. M. B. 2074, Agard Street Yaba, Lagos.	Prime (USA)
-		

The following address is given as distributor for Hewlett - Packard & Co., USA, however no HP computers are marketed, only calculators etc.:

The Electronic Instrumentations Ltd.
N6B/770 Aluseum House Sango
P. M. B. 5402, Ibadan.
Tel. 461577 Telex. 31231

* This column gives the page of the Feb. 1981 edition of Komputa: (Computer Association of Nigeria) on which an advertisment of the vendor appeared.

**A commission at the Federal Ministry of Commerce registers imports of computers and issues licenses. This vendor was not yet issued a license.

Annex 5

Computer installations in Nigeria of interest to the FIIRO CIIS project

University of Ife Computer Centre
Head: Dr. Balogun
IBM 370/135
Operating system: DOS

CAN/SDI software (for running magnetic tapes against SDI profiles) has been installed by Mr. Parise of UNESCO, Paris, in 1979/80. This software has not been in use. To run it, the computer's operating system has to be changed to OS. The magnetic tape units were down during the whole duration of the consultant's mission.

University of Lagos Computer Centre
Head: Dr. A. Salako
IBM 370/145
Operating System: DOS

University of Lagos, Department of Computer Science
Ag. Head: Dr. F. Agbalajobi
CADO microcomputer with 6 terminals.
CADO's own operating system, allowing several concurrent tasks and handling a form of the programming language BASIC called CADOL II.
Twin Intel 8085A central processing unit
96 Kbytes of main storage
3 eight-inch floppy disk drives, 600 kbytes each
52 megabytes of Winchester disk storage are being installed in February 1982.
JUST ASK II Management Inquiry System.

DPMS Data Centre, Lagos
Business Operations Manager: O. O. Uko
IBM 370/145 (256 kbytes)
Operating system: DOS

This centre is run on a commercial basic. Charges are based on cpu-time (₦408.92 per hour), use of virtual storage (₦0.70 kobo per kbyte per process hour, minimum 200 kbytes), number of tape mounts (₦2.91), use of tape drive (₦30.06 per hour), number of input/output operations etc. The National Library makes use of this Data Centre, after key-to-disk input on their own Inforex data preparation system.

R. T. Briscoe Computer Centre, Apapa.
Mr. Ogunleye, Mr. Peter Gersboell
IBM 370/145 (1 Megabyte)
Operating system: OS/VS 2

This is the only IBM 370 installation in Nigeria that runs under OS and not DOS. It would be quite suitable for the CAN/SDI programs. However, due to

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bottlenecks in respect to qualified personnel, management has decided not to take in any outside jobs.

Royal Exchange Assurance (Nig.) Ltd.
Computer Department, Oshodi
Contact Mr. Taiwo Abiola
IBM 370/115 (192 kbytes)
DOS/VS, POWER/VS, TP Monitor
8 Terminals IBM 3277

This centre is less than 2km away from FIIRO and has a modern concept of on-line interactive operation (as aginst batch operation). FIIRO might look into possibilities of using this computer while waiting for its own computer.

University of Ibadan Computer Centre
IBM 370/145
Operating system: DOS

This centre processes the data for the Union List of Serials, a project undertaken by the University of Ibadan Library for the serial holdings of about 23 Nigerian libraries. (The first Union List will appear in 1982).

Annex 6

FIIRO/UniLag Training Course

in

Computerised Information and Documentation Systems

18 - 22 January 1982

P r o g r a m m e:

MONDAY 18TH JANUARY 1982

8.00 - 9.30 a.m.	REGISTRATION
10.00 - 12.00 noon	OPENING CEREMONIES
12.30 - 14.00 p.m.	LUNCH BREAK
14.00 - 15.30 p.m.	INFORMATION AS A PREREQUISITE FOR EFFICIENT MANPOWER UTILISATION AND NATIONAL DEVELOPMENT Mr. R. O. Sodipe Federal Institute of Industrial Research, Oshodi.
15.30 - 15.45 p.m.	Break
15.45 - 17.00 p.m.	THE SOCIETAL IMPACT OF COMPUTERISED INFORMATION SYSTEMS. Dr. Femi Agbalajobi, Head, Department of Computer Sciences, University of Lagos.

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TUESDAY 19TH JANUARY 1982

9.00 - 10.30 a.m.	THE COMPUTER IN INFORMATION WORK H. G. Koerner, UNIDO Consultant, FIIR, Oshodi.
10.30 - 10.45 a.m.	Break
10.45 - 12.30 p.m.	SOURCES OF TECHNO-ECONOMIC INFORMATION R. O. Sodipe, FIIR Oshodi.
12.30 - 14.00 p.m.	LUNCH BREAK
14.00 - 15.30 p.m.	DESIGN CONSIDERATIONS FOR FIIRO'S COMPUTERISED INDUSTRIAL INFORMATION SERVICE. Dr. M. O. Afolabi, FIIRO/UNILAG Project Co-ordinator, Department of Computer Sciences, University of Lagos.
15.30 - 15.45 p.m.	Break
15.45 - 17.00 p.m.	GENERAL DESIGN CRITERIA FOR COMPUTERISED INFORMATION STORAGE AND RETRIEVAL SYSTEMS H. G. Koerner, UNIDO Consultant, FIIR, Oshodi.

WEDNESDAY 20TH JANUARY, 1982

9.00 - 12.30 p.m.	TRIP TO UNIVERSITY OF LAGOS (FIIRO-UNILAG CIIS PROJECT)
12.30 - 14.00 p.m.	LUNCH BREAK
14.00 - 15.30 p.m.	DEVELOPMENT INFORMATION DATA BANKS. Dr. W. O. Aiyepeku, Dept. of Library Studies, University of Ibadan.
15.30 - 15.45	Break
15.45 - 17.00 p.m.	INDUSTRIAL AND INVESTMENT INFORMATION DATA BANK. Mr. P. B. Brahma/V.S. Okobi, UNIDO Consultant, Nig. Ind. Information & Promotion Centre, Fed. Ministry of Industry.

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THURSDAY 21ST JANUARY, 1982

9.00 - 10.30 a.m.	DATA COMMUNICATIONS FACILITIES FOR DATA TRANSMISSION. Mr. O. O. Olugbile, U. B. A. Data Processing Department.
10.30 - 10.45 a.m.	Break.
10.45 - 12.30 p.m.	COMPUTERISED UNION CATALOGUES Mr. Aramide, University of Ibadan Ibadan.
12.30 - 14.00 p.m.	LUNCH BREAK
14.00 - 15.30 p.m.	GLOBAL TELECOMMUNICATION NETWORKS FOR INFORMATION AND DATA TRANSMISSION. Mr. J. A. Dosunmu, Ag. Director, National Library of Nigeria.
15.30 - 15.45 p.m.	Break
15.45 - 17.00 p.m.	PROSPECTS AND PROBLEMS OF COMPUTERISATION IN NIGERIA. Dr. Olayide Abass Department of Computer Sciences, University of Lagos.

FRIDAY 22ND JANUARY, 1982

9.00 - 10.30 a.m.	APPLICATION OF COMPUTERS TO LIBRARY OPERATIONS IN NIGERIA. Mr. A. O. Olafioye, National Library of Nigeria.
10.30 - 10.45 a.m.	Break
10.45 - 12.30 p.m.	EXTERNAL TELECOMMUNICATION FACILITIES FOR DATA TRANSMISSION. Mr. 'Niyi Raji, Nigerian External Telecommunications Ltd.
12.30 - 14.00 p.m.	LUNCH BREAK
14.00 - 15.00 p.m.	GENERAL DISCUSSION
15.00 - 16.30 p.m.	CLOSING CEREMONIES.

Annex 7

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Annex 8

FIIRO/UNILAG Training Course in Computerised Information and Documentation Systems, January 1982

Horst G. Koerner, UNIDO expert

The Computer in Information Service (with Emphasis on User Requirements)

Abstract: A list of user requirements is given. Not all requirements can be fulfilled to 100%, but computers can help to achieve better user satisfaction. A corresponding list of measures involving computers is presented. The possibilities of using computers for information work in developing countries are outlined.

The necessity of providing information to the user and the potential user has been shown in other papers of these proccedings. How can the computer help in providing information services that will satisfy the user of information?

For the user it generally does not matter, whether his requirements are met with the assistance of computers or otherwise. Most users would rather communicate with a friendly and knowledgeable person than with a computer terminal. Even consulting card catalogs and printed indexes and reference works is more agreeable to most people than trying to use a terminal. However, this is changing and more and more users are willing to learn how to conduct their searches by striking keys and viewing screens or printouts. Ideally, an information officer or librarian with experience in computer searching will act as an intermediary to translate the user's wishes into search formulations and command language instructions.

The design of information and documentation systems should always be guided by user requirements, regardless of the degree of computerization involved. User requirements may be stated as follows:

A user would like to get information

1. - when
2. - and where the need comes up,
3. - with a minimum of costs,
4. - time

5. - and effort spent.

The information should be

6. - correct,
7. - relevant to his need and
8. - up-to-date.

Sometimes he will require

9. - all relevant information,
   at other times he may require
10. - a selection of the existing information,

He may want to

11. - see and/or hear the information immediately
12. - take it with him in recorded form, i.e. have it available at a later time,
13. - or have it delivered to a specified address.
14. - Often a user will want to be made aware of new information as it is produced.

Not all requirements can be fulfilled to 100%. Every system design will be a compromise bundle of measures. e.g. it is too costly to make all information accessible 24 hours per day, 7 days a week. However, systems making full use of the possibilities that computers offer can make quite a leap forward in fulfilling many of the user requirements. This will now be shown point by point.

1. Availability

The Lockheed Dialog Information Service e.g. is available 22 hours per day on weekdays and 6 hours on Saturdays.[1] Other information searching systems that link the home TV set to a central computer via telephone line (Videotex, Prestel) operate on 7 days a week.

2. Global Access

Portable terminals and domputerised data transmission makes access to international data banks possible from any telephone in the industrialised countries and from many centers in the developing countries. Access via telex is also possible but very slow.

3. Low Cost

The cost of computerization is high. However, through a large number

of users, the cost per use can be made quite reasonable. A typical search in an international data base might cost from US $3 to 15. Computerized production of abstracts journals and printed indexes can reduce costs in the long run, although, here again, the initial costs may be high.

The trend in computer hardware prices is continuing downward, due to technological innovations. Looking at the price per operation performed and per bit stored, the downward trend is quite dramatic.

Software development costs are a major cost factor and often the software costs exceed those of the hardware. The cost of developing sophisticated information and documentatio software packages may easily exceed a million US dollars. Information retrieval software packages on the market for large computers, e.g. IBM STAIRS or TSI DOCU/MASTER will rent for more than US $1,000 per month or sell for more than $50,000 dollars. Retrieval software packages for smaller computers are available from $30,000 down to $10,000.

4. Time of the User

One of Ranganathan's "Five laws of library science" is "Save the time of the user". Computers can effectively cut the time needed by a user for a search compared with manual searches in printed indexes etc. For many of the simple searches in a library, e.g. for the location of a book, card catalogs can perform quite well. But due to the high costs of maintaining card catalogs some libraries, e.g. the Library of Congress, are now discontinuing their card catalogs. Instead, computer terminals or computer-produced microfiche catalogs are provided to the users.

5. User Effort

a. Effort to Learn to Use and to Operate a Terminal

A system tends not to be used much if the effort required from the user is high. Therefore the use of computer terminals for information work should be made as simple as possible. Experience has shown that it is very difficult for one person to remember more than one or two command languages. New systems should, as far as possible, adapt a standardised "common command language"[2] (see also last page of "The key to Information in Europe").[3]

The so-called "menu technique" makes it quite easy for a user to operate a terminal.

b. Effort to Perform Searches

Some types of searches are very much easier to perform by computer than by manual methods. Consider someone looking for information on infant food produced in Nigeria and containing soy-bean. In computerized retrieval systems you should be able to freely combine search terms which will considerably narrow down the amount of information that must be scanned. Subject headings like "infant food", "Nigeria" or "soy-bean" may each have a large number of entries, but the combination will bring it down to only a few items.

In some retrieval systems, generic searches may be specified. E.g. "Nigeria" may be substituted by "West Africa" in the above search. With an instruction "West Africa (generic)" the computer will then search under all the 17 country names under which the information may be filed. Generic searches can be very tedious in manual systems.

6. Error-free Information

Although errors do creep into computerized retrieval systems, they can be more easily eradicated and corrected than in manual systems. Many checks and double checks are possible. Typing errors are reduced because information already stored and corrected does not have to be retyped, which often introduces new errors in manual systems.

7. Relevance

In subject searches, achieving a high relevance score (percentage of the retrieved items that are actually relevant to the user) is one of the more difficult tasks. Relevance must always be assessed together with recall (ratio of relevant items retrieved to number of relevant items actually in the collection). The user should be able to vary his search strategy in the direction of high relevance or high recall. Computerized systems can be made to perform quite well regarding relevance and recall, by offering the user help in formulating and adjusting his queries. One of the tools employed is a computer-maintained thesaurus. Use of controlled vocabularies and classification schemes may be complemented by free terms, searching in the texts of titles and abstracts, etc. Thus, many more access points to a document can be made available through computer searching.

Searching in dialogue mode makes it possible to narrow down search outputs to the really relevant information. This is the main reason for using

on-line systems. The speed of getting the information is mostly a secondary aspect only.

8. Up-to-date Information

It is much easier to keep computerized information stores up-to-date than manual ones. Printed indexes produced by computer photo-type-setting can be made with a very short time lag and can be cumulated quickly. Microfiche listings can be produced cheaply by computer and thus can be up-dated frequently.

9. Comprehensive Information

If a user wants his search to cover all available information sources, computerized systems offer quite comprehensive converage in almost all fields, ranging from numerical data to newspaper clippings. Worldwide, the number of records publicly available in information banks is of the order of 100 million.

10. Selective Information

If a user does not need comprehensive coverage, he may wish to state some criteria for selection, e.g.

- the newest information on a subject
- those books on a subject that are available in local libraries or bookstores
- review articles only
- exclude articles in the journals that I read regularly.

Computerized systems can and should allow such criteria. Some systems rank their output according to the probable degree of relevance to a query. This makes it possible for the user to cut off the listing at any point. A preliminary response stating the number of items found is very useful when deciding whether to ask for all available information.

11. Short Response Time

On-line information systems usually have quite short response times, ranging from fractions of a second to a few seconds. Very large and fast computers can service many users simultaneously without appreciable time delay.

12. Form of Output

Various forms of output are available from computerized information systems:

- video display
- synthetic voice output (this can be transmitted to a normal telephone)
- hard copy of variable quality, ranging from crude matrix print through correspondence quality print to computerized typesetting
- microform output, from simple to typeset quality.

13. Printout and Document Delivery

To save costs, printouts are often run off-line and mailed to subscribers. Copies of documents or microfiches may be ordered on-line at the end of a search. These are also mailed to the user. In the future, the electronic delivery of primary documents will be cost-effective in many cases. Several systems are being developed for the "Office of the Future"[4].

14. SDI Services

As new information becomes available in machine-readable form, it can be run against a set of standing profiles. A subscriber will receive printouts of bibliographic references, preferrably with an abstract.

To economize, standard profiles for whole groups of users are offered by many services. The output is distributed in duplicated form.

The output from individual profiles can be stored in the computer and called off by the user whenever he wants to look at it on a terminal. Some users prefer this "paperless communication" to receiving the printouts.

15. Further Computer Applications in Information Work

a. Abstracts Journals and Bibliographies

Once data is recorded in machine-readable form it can be put to several uses. The publication of abstracts journals with indexes and the creation of bibliographic data bases is usually one integrated operation.. Specialized bibliographies can be produced from the same data.

b. Directories

Directories and other listings with associated indexes can often be prepared using the avialable software packages of information centres. The "Directory of Industrial Information Services and Systems of Developing

Countries" is an example of such a directory published by UNIDO.[5] It is produced with the ISIS software installed on the IBM computer of the Vienna International Centre.

Another computer produced directory is the "ODIN Database Guide" (On-line Documentation and Information Affiliation, Federal Republic of Germany).[6]

Malfunction of computerized information services

Computers tend to malfuction sometimes and this must be taken into account when designing computerized information systems. Most modern computers and operating systems are so designed that even when parts of the computer don't function properly, work can be continued with the available resources. Large centers like that of Lockheed usually have more than one computer, so that back-up is available. With proper maintenance, the down-time of computers can be as low as less than one percent.

For some services, like printing directories or SDI, it is not so critical if a computer is down for several hours or even days.

Many of the computer applications described require data communication facilities. Even in Europe it is sometimes quite difficult to set up reliable and error-free connexions. But the P&T authorities in the various countries are working at solutions and the Euronet telecommunications network can be considered a major achievement, considering that many national P&T services had to coordinate their efforts.

Possibilities in developing countries

Global information systems are still not accessible on-line from most developing countries, except by telex, which is really too slow for the kind of dialog you want to have with the computer (50 bits/second instead of the usual 300 or 1,200 bits/second). Per bit of data transmitted, telex is much more expensive than data transmission using modern technology, such as packet switching through concentrators as it is used in Euronet. A few developing countries have made arrangements for installing data communication nodes with a concentrator. However, it must be possible to reach the node through local telephone lines with a certain dependable transmission quality. Data lines allowing higher speeds would be better yet.

Even if these infrastructural facilities in the communications sector are not yet available, computers can be used in the meantime in ways that do not require data transmission over distances more than a few hundred meters:

1. Use of small computers for service to local users and visitors and for services by mail or messengers.
2. Batch processing on available large computers e.g. SDI services, compilation of union catalogs, etc, as well as on-line processing.
3. Computer production of information tools that can be used manually, e.g. alphabetical indexes, directories etc. This can be done with small or large computers.
4. Use of the services of overseas information centers by mail, and, as far as practical, by telex.

Preparations for building up data bases can be made by recording bibliographic and other data in machine-readable form while producing manual tools like catalog cards, bibliographies, abstract journals etc. Small word processing systems that record the data on diskettes or magnetic tape are suitable for this (punched cards and punched paper tape are not as practical). Data bases may also be stored in international data base hosts as private or public files.

Outlook

The production and distribution of knowledge is one of the major industries. New technologies are evolving: electronic publishing, storage media using laser writing and reading, direct satelite broadcasting, personal computers, use of the office typewriter and the home television set (with a simple keyboard attached) for accessing large volumes of information, etc. With so much information readily available, it becomes all the more important to continue developing the intellectual tools with which this information can be handled in an efficient and orderly way. Classification, indexing, compiling directories and standardisation are some of the areas where information scientists can make their contribution.

Literature:

1. Database Catalog. DIALOG Information Retrieval Service, Palo Alto, Calif.: Lockheed 1980, 38p.

2. Euronet DIANE Common Command Language. Luxembourg, 1981, folded leaflet.

3. The Key to Information in Europe. Luxembourg: Euronet DIANE 1981, 10p.

4. Euronet DIANE News, No. 22, Feb./March 1981, p.7.

5. Directory of Industrial Information Services and Systems in Developing Countries. Vienna: UNIDO 1981, 103p.

6. ODIN Database Guide. Heidelberg: Gesellschalt fur Information and Dokumentation (GID) 1981, 365p.

7. Euronet DIANE Directory. Luxembourg 1981, 107p.

Annex 9

FIIRO/UNILAG Training Course in Computerized Information and Documentation Systems, January 1982

Horst G. Koerner, UNIDO expert

General Design Considerations for Computerized Information Storage and Retrieval Systems in Nigeria

In my paper "The Computer in Information Service", I stressed that the design of computerised systems should be guided by user requirements. A catalog of requirements was enumerated. Other design considerations are, of course, the resources available and the way in which alternative measures that are considered perform. Certain constraints may also have to be taken into account.

The resources we must consider are: available computers (hardware), available software, skilled personnel, time, money, and available knowledge on information storage and retrieval systems.

Among the alternative measures that should be considered are: Using software offered on the market or programming your own, size and cost of the computer, shared use of the computer with other applications, type of storage media, file organisation, cooperation.

Computers in Nigeria

I understand that about 200 computers are installed in Nigeria, not counting the microcomputers. Of these more than 70 are IBM, more that 30 each are ICL, NCR and DEC, while the rest are Data General, Wang, Prime, Texas Instruments and others. A good overview of the computer companies that are operating in Nigeria can be obtained by looking at the advertisements in the biennial magazine of the Computer Association of Nigeria, Komputa. Fifteen companies advertised in the February 1981 issue 1, volume 1. Eight of these offer computers. The few companies that did not advertise can be located by looking in directories like the "Nigerian Yellow Pages" or "Major Companies of Nigeria", and by asking knowledgeable people. (The yellow pages of the National Telephone Directory 1980 lists only one company, the one that helped publish the Directory).

Company:	Computers:
Comsoft, Surulere, Lagos	Texas Instruments
Data Sciences Nig. Ltd., Ikeja, Lagos	DEC (PDP)
	Inforex
Data Systems Nig. Ltd., Surulere, Lagos	CADO
Datamatics Co. (Nig.) Ltd., Ikeja, Lagos	Wang
Debis (Nig.) Ltd., Ikeja, Lagos	Perkin-Elmer
	Apple
DPMS, Lagos	IBM
Haven Nigeria Computer Co. Ltd., Lagos	CMC
International Computers (Nig.) Ltd., Ikoyi Lagos.	ICL
Joint Komputer Kompany Ltd. (JKK), Ibadan and Ebute-Meta, Lagos	Data General
Leventis Technical Ltd., Lagos	Olivetti
Universal Computers, Yaba, Lagos	Prime

Software

a. SDI software

The only software in the area of information and documentation that has been installed in Nigeria so far is an SDI software package on the University of Ife's IBM 370/135 computer. It is the CAN/SDI system which was developed in Canada and which the Canadian government provides free of charge to developing countries through UNESCO in Paris. Such systems must be adapted to the particular IBM 370 configuration at hand and this was done by a programmer sent to Ife from Paris. Unfortunately, the use of this system has not yet taken off, although magnetic tapes for using it have been sent to Nigeria as development aid. I hope it will be possible to get an SDI-service into operation soon, either at Ife or in Lagos. One of the problems is that CAN/SDI is a program package that runs under the OS operating system, while the IBM computers at the Universities of Ife and Lagos run under DOS (Disk Operating System).

b. Software for retrospective searches

Retrospective searching is usually done on-line, not because of the urgency of obtaining answers, but because of the necessary dialog between the searcher and the computer. I know of only one major retrieval system that has not changed over to on-line searching and still operates in batch mode: one of

the services of the Internationale Dokumentationsgesellschaft fuer Chemie in Frankfurt (IDC), in a specific area of organic chemistry.

The kind of searches that we are thinking of (free combinability of search terms) require a different file organisation in the computer storage than what is usually encountered in data base management systems. These can be searched on a number of keys by specifying the value in certain fields, e.g. Type of industry field: breweries; Location field: Lagos state. Data base management systems are useful for many applications, but they have their limitations which means that they are not the kind of software we need. The file organisation we need is inverted files.

Inverted files are quite similar to indexes. In a search "infant food" AND "soybean" AND "Niger the computer will compare the document numbers filed under "infant food" with those filed under "soybean". Matching numbers are then compared with the document numbers filed under "Nigeria". This is all done in fractions of a second.

Some of the more modern data base management systems make use of inverted files. The file organisation is often called "relative" or "relational" ("relational databases"). Such systems could be adapted for information and documentation applications, but it is better to use software especially designed for the many interrelated tasks that have to be carried on by an information and documentation centre. The systems are designed with particular emphasis on bibliographic applications [1, 2].

In software directories and in marketing brochures it is sometimes difficult to identify the "information and documentation" software packages. I have looked through one directory, the Infratest Software Information Service (Munich, bienially) and found the following systems:

Software package:	for computer:
DOCU/MASTER	large IBM
DOKIS (Nixdorf)	Nixdorf 887C
DOMESTIC	PDP 11/70 or Philips 8857 M
GOLEM (Siemens)	large Siemens.
UNIDAS/1100 (Univac)	UNIVAC 1100 series

From my own knowledge of the field I must add:

STAIRS (IBM)	large IBM
CDS/ISIS	large IBM

Software package:	for computer:
CAN OLE	large IBM
MINISIS	Hewlett-Packard 3000
MIDONAS-80	PDP 11 34
STATUS	variety of computers, including IBM, PDP 11, ICL, Prime, Burroughs.

Further systems are listed on the last 2 pages of reference 1.

c. Features of Software packages

Some of the systems mentioned are very versatile and offer SDI, thesaurus administration and print generation, in addition to retrospective searching, e.g. DOMESTIC, MINISIS, MIDOMAS and STATUS. Some even include library automation.

d. Programming

Programming the systems mentioned usually took several years. Only in special cases can the advice be given to program your own system. It requires highly skilled programmers and the close cooperation of an information scientist with enough experience in computerised documentation.

Shared use of a computer

Large computer centers almost always work for many customers, and they usually have some system of assigning priorities to various jobs. Some centres offer on-line use and do the batch jobs in the background. It is quite feasible to use such a centre for information and documentation work. Sometimes the retrieval system is put on-line for only specified hours of the week.

An alternative is to have a minicomputer mainly for the information centre's own use. Systems like DOMESTIC, MIDONAS, and MINISIS were developed with this concept. The minicomputers can handle several terminals, up to 60 in the case of the Hewlett-Packard 3000. Minicomputers can, of course, also be put to other uses within the organisation.

Type of storage media

Magnetic tape is used for SDI services and for sending data to information centresto update their files.

For on-line searching, hard disk storage is essential. Fixed or removable disk packs are used and their storage capacity ranges from several

million bytes (characters) to a billion.

Floppy disks have a capacity of up to several hundred thousand bytes. Their use is limited to very small systems. They are also used for data capture and for exchanging machine readable data by mail.

Cooperation among information centres

For an information centre it is quite important to cooperate with other centers in the country and abroad. Standards help to make the exchange of machine-readable records easier. If several centers use the same computer and software, problems of conversion etc. are minimised. However, record formats can be converted by computer, e.g. the CAN/SDI software contains 12 programs for reformatting 12 different tape formats into the NRC common data base format (National Research Council, Canada). It is similar to the MARC II data base format of the Library of Congress.

The Canadian IDRC (International Development Research Centre) has supplied the MINISIS software free to developing countries. Worldwide, about 20 MINISIS systems are in use or being installed, about 5 of them in Africa. This, apart from other reasons, makes MINISIS a very attractive system. MINISIS can only be used on Hewlett-Packard 3000 computers. Hewlett-Packard does not market these computers in all countries, because of the necessary investments in servicing work-shops, trained service personnel etc. Until now, Hewlett-Packards does not offer its HP 3000 in Nigeria. The National Library is looking into ways of acquiring HP 3000s and having them serviced from overseas service organisations.

References

1. Minicomputers in Information and Documentation. Proceedings of a Workshop held 30.6.-4.7.1980, GID, Frankfurt 1981, 146p.

2. Valantin, R.L.: CDS/ISIS and MINISIS - A Functional Analysis and Comparison. Ottawa: IDRC 1981, 88p.

A Portable Terminal

785 Portable Data Terminal

The *Silent 700** Model 785 Portable Data Terminal is a member of the innovative 780 Series Family. It combines 120 characters-per-second optimized bidirectional printing with the advantages of portable remote access to give you a high performance data terminal that can be used anywhere there is a standard telephone and electrical outlet.

With the 785's built-in acoustic coupler, users can transmit and receive data at 110, 300 or 1200 bits-per-second speed. Standard features include a full ASCII keyboard, a 5x7 dot matrix character font and operator programmable answerback memory. These along with user-oriented options like an ASCII/APL keyboard and character set and international keyboards add to the 785's versatile characteristics.

Standard Features

- ☐ 120 characters-per-second optimized bidirectional printing
- ☐ Silent operation
- ☐ 5 x 7 dot matrix character font
- ☐ 80 character line, 10 characters/6 lines per inch
- ☐ 95 printable ASCII characters, 33 control character print symbols
- ☐ Last character/last line printed visibility
- ☐ ASCII code
- ☐ Full duplex operation with internal modem
- ☐ Full or half duplex operation with EIA interface port
- ☐ Asynchronous, EIA RS-232-C serial interface
- ☐ 110 to 9600 BPS via EIA interface port
- ☐ Printer ready/busy indication via EIA reverse channel control or DC3/DC1 transmission
- ☐ Odd, even, mark or space parity
- ☐ Parity error symbol (on/off)
- ☐ Carriage jam detection
- ☐ 100 foot paper roll accommodation
- ☐ Full ASCII alphanumeric keyboard and character set
- ☐ 2-key lockout
- ☐ Automatic character repeat
- ☐ Keys for ONLINE, CMD, RESET, PAPER ADVANCE
- ☐ Built-in acoustic coupler compatible with Bell 103 type, Racal-Vadic 3400 Series data sets
- ☐ Auto disconnect feature
- ☐ Selectable data transmission rates of 110, 300, or 1200 BPS
- ☐ Operator programmable answerback memory; up to 32 characters
- ☐ Status reporting via printer (bell tone and L.E.D. indicators)
- ☐ User selectable configuration parameters
- ☐ Self test diagnostics capability
- ☐ Remote digital loopback test
- ☐ Analog loopback test
- ☐ Carrying case

Options

- ☐ International character sets: United Kingdom, German, Danish-Norwegian, Swedish-Finnish, and French
- ☐ Alternate ASCII character sets (ASCII/APL and ASCII/Katakana)
- ☐ Protected answerback memory
- ☐ EIA interface cable

*Trademark of Texas Instruments

Specifications

POWER REQUIREMENTS	
Voltage:	90-134 Vac
Frequency:	45-450 Hz, single phase
Power:	90 Watts maximum
PHYSICAL DIMENSIONS	
Size:	40.64 cm (16 in) D; 40.64 cm (16 in) W; 15.24 cm (6 in) H
Weight:	7.7 kg (17 lbs)
Acoustic Noise Level:	Less than 55 dB (A-weighted), measured at 0.9 m (3.0 ft) directly in front
ENVIRONMENTAL (Operating)	
Temperature:	10°C to 40°C (50°F to 104°F)
Humidity:	10% to 95% (no condensation)
Altitude:	To 3048 m (10,000 ft)
ENVIRONMENTAL (Storage)	
The terminal, exclusive of the thermal paper, shall meet the physical and functional requirements of this specification.	
With Shipping Container	
Temperature:	–30°C to 70°C (–22°F to 158°F)
Humidity:	10% to 95% (no condensation)
Altitude:	To 15,240 m (50,000 ft)
Cargo Bounce:	Per mil-std-810B
Without Shipping Container	
Temperature:	–30°C to 70°C (–22°F to 158°F)
Humidity:	10% to 95% (no condensation)
PRINTER	
Method:	Nonimpact, electrically heated, 5 x 7 dual-character matrix thermal printhead, prints on thermographic paper.
Character Set:	95 printable characters in normal mode with 33 ASCII or CCITT control characters when configured.
Character Size:	2.66 mm x 2 mm (0.105 in x 0.080 in)
Line Length:	203.2 mm (8 in) 2.54 mm character spacing (10 characters-per-inch); 80 characters-per-line.
Line Spacing:	4.23 mm (6 lines-per-inch)
Printing Rate:	120 characters-per-second
Paper:	TI thermographic printing paper (Part No. 972603-0001) 216 mm (8.5 in) x 30.5 mm (100 ft); last 3 m (10 ft) color coded
Platen:	Friction-feed
KEYBOARD	
Code:	ASCII, CCITT; 128 codes generated
DATA TRANSMISSION	
Interface:	EIA RS-232-C/20 mA dc-current loop neutral only
Speed:	110, 200, 300, 600, 1200, 2400, 9600 bps
Code:	ASCII
Mode:	Full duplex, half duplex and half duplex with reverse channel
Parity:	Transmit odd, even, mark, space, check odd, even
Received Data Buffering:	521 characters
COMMUNICATIONS INTERFACE (DC Current Loop)	
Maximum Current:	100 mA (transmit or receive)
Nominal Current:	20 mA (transmit or receive)
Maximum Voltage Drop:	3 Vdc at 20 mA (transmit); 1 Vdc at 20 mA (receive)
INTERNAL MODEM/ACOUSTIC COUPLER INTERFACE	
Compatibility:	Racal Vadic 3400 or Bell 103-type data sets
Mode:	Originate only
Modulation:	Racal-Vadic 3400: Differential Phase Shift Keying (DPSK) Bell 103-type: Frequency Shift Keying (FSK)
Transmit Carrier Frequencies:	Racal-Vadic 3400: 2250 Hz Bell 103-type: Mark = 1270 Hz; Space = 1070 Hz
Receive Carrier Frequencies:	Racal-Vadic 3400: 1150 Hz Bell 103-type: Mark = 2225 Hz; Space = 2025 Hz
Transmit Level:	Racal-Vadic 3400: –17 dBm Bell 103-type: –14 dBm
Receiver Sensitivity:	Both Types: 40 dBm

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