



TOGETHER
for a sustainable future

OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.



TOGETHER
for a sustainable future

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

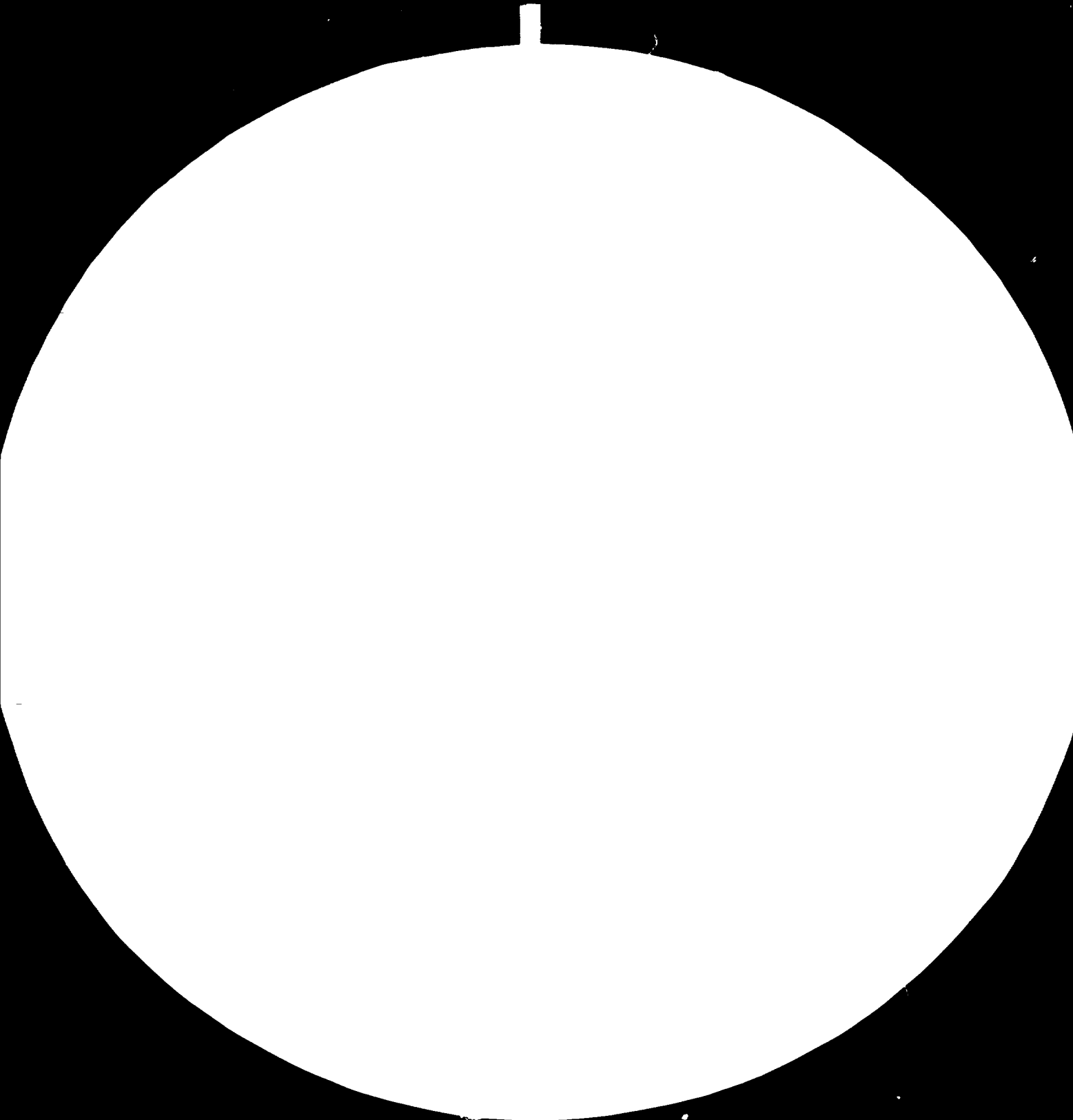
FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org





2.8



3.2



4.0



Figure 1. Resolution test patterns for the resolution test.

Resolution test patterns were presented in the following order:

1. 1.0
2. 1.1
3. 1.25
4. 1.4
5. 1.6
6. 1.8
7. 2.0
8. 2.2
9. 2.5
10. 2.8

RESTRICTED

10339

19 January 1981

English

(R)

A SHORT TERM CONSULTANCY TO INTRODUCE
A COMPUTER-BASED PROJECT EVALUATION SYSTEM. OMAN

SI/OMA/80/802

Terminal report

Prepared for the Government of Oman
by the United Nations Industrial Development Organization,
executing agency for the United Nations Development Programme

Based on the work of A.S. Yeiser,
adviser on computer technology

United Nations Industrial Development Organization
Vienna

This report has not been cleared with the United Nations
Industrial Development Organization which does not, therefore,
necessarily share the views presented.

000000

ABSTRACT

This three month project "A Short-term Consultancy to introduce a Computer-based Project Evaluation System (SI/OMA/80/802)" has as its objectives, 1) to strengthen the Government capacities for planning and monitoring industry, and 2) to improve the industrial project evaluation and control capabilities as well as managerial capacities of the Directorate General of Industry (DGI) through utilization of computer systems.

The main conclusions are: 1) the DGI lacks rapid access to needed technology and market information (some of this information can be obtained through a computerized industrial registration data base and some by installing a terminal connected to the Gulf Organization for Industrial Consulting (GOIC) Industrial Data Bank, 2) analytical computing capability and word processing are needed to make operations more effective.

The main recommendations are: 1) to install two or more integrated work station terminals with word processing and limited computing capability able to display and print in both Arabic and English and communicate on line with Industrial Data Bank, and, if feasible, with the Directorate General of Finance (DGF) computer, and 2) to implement an industrial registration data bank with on line input and query capability that communicates in both Arabic and English.

CONTENTS

Introduction	..	4
I Objective and Logic of Project	..	5
II Activities carried out and Outputs Produced	..	6
III Achievement of Immediate Objectives	..	7
IV Utilization of Project Results	..	8
V Findings	..	9
A Computerized Aids to Judgemental Evaluation	..	11
B Computerized Aids to Non-Judgemental Tasks	..	12
VI Recommendations	..	15
Attachments		
1. Interactive Computer Techniques	..	16
2. Computer System Structures - Central versus Network	..	23
3. Data Base Concepts	..	25
4. Word Processing	..	29
5. Information Required from the Computer Centre	..	32
6. Letter to L. Biritz	..	33
7. Request for Information on Project Evaluation Computer Programs	..	38
8. Request for Information on the UNIDO Industrial and Technological Information Bank	..	40
9. Request for Information on the UNIDO Industrial Inquiry Service	..	42
10. Bibliography of Selected American Publications on Feasibility Studies	..	44

INTRODUCTION

The Ministry of Commerce and Industry has for some time wanted to make use of computers in support of the licensing, management and registration functions.

In 1978 a study of the management information systems of the Ministry was completed by a private consulting firm, Tetra Tech International, Inc. It recommended that a minicomputer be installed at the Ministry with several information systems programmed on contract. These recommendations were rejected in favour of providing the Ministry with terminals connected to a computer in the Directorate General of Finance (DGF) with the necessary programming done by DGF. These terminals have not yet been installed and the first element of the information system, the Commercial Registration System is not yet finished.

This three month Specialized Industrial Services project was requested by the Director General of Industry and approved in March 1980 by Mr N. Tandon, Head, EX/PC/DEV. The mission became operational 28 Oct 1980. The UNIDO SIS project budget was US \$ 18,200. The Government provided office accommodation, secretarial assistance and transportation for the consultant.

The objectives of this project are 1) to strengthen the Government capacities for planning and monitoring industry and 2) to improve the industrial project evaluation and control capabilities as well as managerial capacities of the Directorate General of Industry through utilization of computer systems. The recommendations of this project, when implemented, will fulfill these objectives.

I. OBJECTIVES AND LOGIC OF PROJECT

The formal objectives as stated in the project document are shown in the introduction. The working rationale was to observe closely the functioning of the Ministry by participating in some of the activities, interviewing working members of related organizations, analyzing documentation and feeding tentative recommendations back to management to determine their acceptability. Thus it was possible to develop a clear picture of what was desired as well as what would be useful.

Immediate working objectives were developed in this process. The first objective is to provide access to information about the current state of industrial technology in specialized fields and about the potential market for industrial products. This information is necessary to support judgemental decisions as to whether to grant industrial licences to applicants and whether to grant incentives to existing industries. Decisions made without such information risk inhibiting development or encouraging the development of inferior and non-competitive industries. The second objective is to provide computer assistance to routine tasks to improve the overall effectiveness of the organization.

These working objectives led to the concept of microcomputer-based integrated work station terminals.

II. ACTIVITIES CARRIED OUT AND OUTPUTS PRODUCED

Activities carried out on this project included working directly in the Directorate General of Industry (DGI) with close observation of and limited participation in the normal activities. Formal and informal interviews were held with the personnel of DGI and related organizations (including the Directorate General of Finance, the Development Council and the Ministries of Telecommunications and Petroleum) documents and forms were analyzed.

Several applications for industrial licenses were thoroughly analyzed and the results were compared with the original analyses by the staff. This was done to develop judgement as to the real value to be expected from possible computerized aids.

Reports of previous studies were reviewed and the reasoning behind the acceptance or rejection of recommendations was determined.

There are several outputs from this project. A Project Proposal for implementation of the recommendations has been drafted involving 24 man months of experts' time and \$ 48,000 of equipment. A midterm informal communication to the Director General of Industry was prepared to inform him of interim conclusions and problems. A bibliography of selected recent American publications on various aspects of project evaluation was prepared at the request of the Director of Project Studies (see Attachment 10). Various other informal technical assessments were provided on request.

III ACHIEVEMENT OF IMMEDIATE OBJECTIVES

The immediate objectives of this study have been achieved. A Project Plan for the implementation of the recommendations of this report has been drafted. In some cases information was impossible to obtain within the limited duration of this project so that reasonable assumptions were made. These assumptions should be verified in the first phase of follow on activities.

These assumptions relate primarily to the interface specifications-electrical and protocol-for both terminal applications and to the accessing procedure and content of the Gulf Organization for Consulting (GOIC) Industrial Data Bank. These assumptions should be verified before any equipment is ordered, and the project plan modified if necessary.

Inability to arrange a trip to GOIC headquarters in Doha during this mission made it impossible to closely examine or test software packages available there. No pertinent software packages were available in Oman during this mission for test.

The standardization of input data for computerized project evaluation must follow final selection of an analysis program. There is a contract study being carried out by a private management consulting firm to redesign input forms for the manual industrial data filing system, but results were not available during this mission. Forms design is discussed in Chapter V, Findings of this report.

IV UTILIZATION OF PROJECT RESULTS

Results of this consultancy project are recommendations and plans for implementation. Their nature is such that these results can only be utilized in an implementation project. Such a project is being seriously considered by the Ministry.

V FINDINGS

The Directorate General of Industry (D.G.I.) of Oman under Mr Barakat Al-Lamki, Director General, consists of three departments, Projects Studies, Industrial Management and Industrial Licence and Registration.

The Project Studies Department has responsibility for recommending acceptance or rejection of applications for industrial licences based on financial analysis and for providing project management on certain government projects. Department personnel include the Director, Dr. Faisal Al-Amir, two assistant directors, an economist, an industrial engineer, (UNIDO OPAS), and a project manager. A new Industrial Management Department is planned to take over project management.

The work load includes the analysis of industrial license applications, currently about four per month and increasing, writing and monitoring contracts with outside consultants for special studies, managing government industrial projects, responding to requests for advice and information and other diverse assignments.

The staff is performing the laborious task of analysis of licence applications quite adequately with respect to determining internal financial consistency. For small and medium projects (less than R.O. 100 000 capital)*the analysis process usually amounts to performing a feasibility study, often supplying missing information. Cash flow and internal rate of return are calculated to verify that the project is not uneconomic as formulated. Large scale project applications usually include adequate feasibility studies prepared by competent consultants.

Considerable effort is devoted to estimating the existing

* Approximately US \$ 290,000

market for the product, recognized as a sensitive and often the limiting economic factor in Oman. A thorough assessment is made of whether the project is viable based on the information supplied in the application.

Testing the assumptions on which the application is based is, however, in most cases beyond the present resources of the organization. Such tests might include questioning whether the market for a product is likely to be eroded by the introduction of newly developed products. For example, "It is likely that the market for glass soft drink bottles in the Gulf area will be reduced by the introduction of newly developed blown plastic containers, and if so when and to what extent"(see also example 2, Attachment 9).

Another type of question is whether technology or equipment exists that is superior to what is specified in an application. For example, "Should ion-exchange water purification equipment be imported, or is battery grade distilled water obtainable from the Muscat desalination plant?", or "Is the Diesel engine-alternator-electric motor-compressor drive specified in an application superior to a direct Diesel engine-compressor drive?" or "considering present and projected prices of LPG and Diesel fuel, which is more economical for fixed engines?" (See also example 1, Attachment 9).

From the range of these questions it seems unlikely that any small group of analysts could possess the encyclopedic knowledge of recent developments in all technologies necessary to answer such question unaided, yet the inability to make such assessments risks allowing the development of inferior or non-competitive industries in Oman.

Two objectives are considered for providing computer aid to project evaluation: providing access to industrial information to improve the judgemental evaluation of projects and aids to reduce the analysts' time required by routine, mechanistic tasks.

A. Computerized Aids to Judgemental Evaluation

Improved judgemental evaluation of projects requires access to industrial information both inside Oman and from the outside. Non computerized access to industrial information is also being investigated (see Attachment 9).

The primary sources of industrial information in Oman are the commercial and industrial registration files. A computerized system for the storage, retrieval and reporting of commercial registration information has been in the design phase for over one and a half years at the DGF. Since this system is being designed to provide information in Arabic only, it can only partially fulfill the requirement of DGI for commercial information. The feasibility of combining industrial registration information in both Arabic and English with this commercial registration system as it is being designed seems very doubtful. At this stage separate systems may be the only immediate workable solution. In the future, of course, information from one system could be merged into the other by design modification.

The industrial registration information system should be a data base structure containing information in both Arabic and English with on-line interactive data entry for reasons more fully explained in Attachements 1 and 3 to this report.

Industrial registration information input form design and (manual) file design have been contracted to a consulting firm, Management Implementation Inc. Results are not yet available, but if the recommended interactive data entry techniques are used in the computerized system, any well designed input forms should be satisfactory since there is no need for alignment of fields with card columns (see Attachment 1, C and D).

To access information about the market and potential competition in the Gulf area as a whole, the Industrial Data Bank of the Gulf Organization for Industrial Consulting (GOIC) is the most promising source. The GOIC data bank can also provide on-line access to industrial data banks in the United States as a source of information on industrial technology developments.

B. Computerized Aids to Non-judgemental Tasks

Functions being considered to mechanize routine tasks are automation of the numerical processes of financial analysis, project progress reporting and "word processing" support for the preparation of reports, contracts, letters, etc. (see Attachment 4).

Computerized financial analysis are being performed by GOIC including the determination of cash flows and internal rates of return with sensitivity analysis. The mathematical processes appear to differ from those used manually in DGI in only a minor detail - the first year is discounted by GOIC, not by DGI - which has a negligible effect on the calculated internal rate of return.

The desirability of standardized financial data in the GOIC

Industrial Data Bank would tend to dictate that all member states use the same program as GOIC. This program could be run on the GOIC computer or, if it is transportable, it could be run locally.

The new UNIDO financial analysis program should be considered for possible replacement of the GOIC program when it becomes available in June 1981 (see Attachment 7).

To facilitate the use of a financial analysis program, forms should be required as a part of the industrial licence application that include a spread sheet showing cash flow by category for several years. The design of these forms, however, should await the selection of a financial analysis program - GOIC or other.

Word processing capability could be provided by separate special purpose word processor equipment (two special purpose word processors are being used by the Oman Development Council) or by integrated work station terminals that could also perform several other functions (see Attachments 2 and 4).

The special purpose word processor and the "very smart" work station terminal are both micro computers composed of the same basic elements. The primary difference is that the word processor has a fixed program and can be used for no other purpose while the "very smart" work station terminal has a variable program and so is able to perform other functions as well.

The project management function of the department is being activated. The department has been given responsibility

for management of three construction projects, an industrial area, a grain silo and a salt refinery. A project manager has just been appointed for the industrial area. Although it is too soon to determine requirements in detail, effective monitoring of activities of this complexity usually requires a computerized activity network analysis and reporting system, eg. PERT or CPM. Programmes for this purpose are available from IBM for the DGF Computer.

VI RECOMMENDATIONS

Implementation of the following recommendations will require services of highly skilled experts for little more than a year. Since recruiting permanent employees for this effort is unreasonable, three alternative approaches are suggested: a UNIDO project could be requested (a suggested outline of a Project Plan has been written), the implementation could be given to a private consulting firm as a turn-key contract, or the recommendations could be implemented as separate elements using the Directorate General of Finance (DGF) to supply certain elements, Ministry personnel and private consultants to supply others. The first two alternatives are likely to produce a more satisfactory and timely result.

1) Install two or more integrated work station terminals with word processing and limited computing capability, able to display and print in both Arabic and English and to communicate on-line with the Gulf Organization for Industrial Consulting (GOIC) Industrial Data Bank and, if feasible, with the DGF computer. Alternatively, these functions could be provided by separate equipments but at increased cost and maintenance effort.

2) Design and implement an Industrial Registration Information System with data base structure using interactive input and query modes that communicates in both Arabic and English. Preferably the commercial registration information should be integrated with the industrial information in a unified data base system.

3) Train Ministry personnel in the use of these facilities.

ATTACHMENT 1

A. Interactive Computer Techniques

A computer can be programmed to display questions and instructions to a user on a video screen and accept answers typed in from a key board. This technique is called "interactive" or "conversational". Significant benefits result from interactive data entry.

Interactive terminal input is generally faster, requires less training and fewer errors are made. It is also the best way to enter a request for information. Instructions can be displayed at each step to train a new operator or guide an executive who is unfamiliar with the system. Experienced users can turn off the instructions to save time. Entering "HELP" at any step can cause the display of a detailed explanation.

Some general principles are discussed below that minimize time and eliminate many errors in interactive data input.

B. Who Should Make Inputs

If possible, data should be entered by someone who knows what it means. Editing and verification should be done by the computer as soon as each item of data is entered. If an error is found by the computer, the user should be informed immediately by the display and asked to correct the mistake before continuing.

C. Source Documents

Copying from a source document onto an input form, then

inputting from this form causes many unnecessary errors and wastes time. The best method is to enter the basic facts directly into the computer at a terminal then let the computer print out the source document. This works well for receipts where the cashier has a terminal. The technique might be used to print licenses or registration forms. This method makes sure that the information on the source document is the same as the information in the computer.

If the source document cannot be prepared on a terminal, the source document itself (or a photo or carbon copy) should be used as the input form. Hand copying from source documents to input forms should be avoided. Copying is always a source of errors.

D. Alternative Selection

Most information items that must be input are one of a few alternatives. For instance, a business can only be one of a few legal types; partnership, limited liability, etc. Typing the complete words into the computer each time wastes time and causes errors.

A much better technique is to have the computer ask the question and display the (most frequent) alternatives. Then the user only indicates which alternative is correct, usually by pushing a single key (see Fig 1). Only unusual inputs that are not displayed must be typed. Of course some inputs cannot be chosen from a list of alternatives and must be typed completely.

After the input is made, it should be displayed for the user to make sure no mistake was made (see Fig. 2).

The complete interactive process to determine the International Standard Industrial Classification number from a terminal is illustrated in F.g 3 through Fig 10.

WHAT TYPE OF BUSINESS?

Push the number key, then the "XMIT" key.

- (1) PROPRIETERSHIP
- (2) PARTNERSHIP
- (3) LIMITED PARTNERSHIP

- (4) LIMITED LIABILITY
- (5) JOINT STOCK
- (6) JOINT VENTURE

- (7) PUBLIC SECTOR

- (9) OTHER

Fig. 1. In entering information about a new industrial licence, the legal type of business must be specified. The computer shows the possibilities. To indicate that the company is a partnership, the user pushes the "2" key, then the "XMIT" key.

PARTNERSHIP

IS THIS CORRECT? (Y, N)

Push "Y" for yes or "N" for no, then "XMIT".

Fig. 2. This is done to make sure there was no mistake in the entry in Fig. 1. To indicate that it is correct, the user pushes "Y" then "XMIT".

WHICH FUNCTION DO YOU WANT?

push the number key for the line you want, then
the "XMIT" key

- (1) GOIC DATA BANK
- (2) INDUSTRIAL REGISTRATION
- (3) FINANCIAL ANALYSIS

- (4) WORD PROCESSING
- (5) BASIC PROGRAMMING
- (6) FORTRAN PROGRAMMING

- (7) OPERATING SYSTEM

Fig. 3. This series of figures shows how a user determines the International Standard Industrial Classification (ISIC) number for a clay brick factory from the terminal. The terminal screen shown above appears as it will after the last person signed off. Since the user knows that the ISIC must be a part of the Industrial Registration system, he pushes the "2" and "XMIT" keys.

DO YOU WANT TO MAKE A:

push the line number key, then the "XMIT" key

- (1) NEW REGISTRATION
- (2) CHANGE
- (3) UP DATE

- (4) REPORT
- (5) ENQUIRY
- (6) UTILITY RUN

Fig. 4. Since he wants to make an enquiry, he pushes "5"
"XMIT".

IS YOUR QUESTION ABOUT A:

Push the line number then the "XMIT" key

- (1) COMPANY
- (2) PRODUCT
- (3) DISTRICT

- (4) PERSON
- (5) NATIONALITY
- (6) INDUSTRIAL CLASSIFICATION
- (7) COMMODITY CLASSIFICATION
- (8) ...

Fig 5. For an industrial classification he pushes "6",
"XMIT".

INDUSTRIAL CLASSIFICATIONS - MAJOR DIVISIONS

For subclasses, push the number then the "XMIT" key.

- (1) AGRICULTURE, HUNTING, FORESTRY AND FISHING
- (2) MINING AND QUARRYING
- (3) MANUFACTURING

- (4) ELECTRICITY, GAS AND WATER
- (5) CONSTRUCTION
- (6) WHOLESALE AND RETAIL TRADE AND RESTAURANTS AND HOTELS

- (7) TRANSPORT, STORAGE AND COMMUNICATION
- (8) FINANCE, INSURANCE, REAL ESTATE AND BUSINESS SERVICES
- (9) COMMUNITY, SOCIAL AND PERSONAL SERVICES

- (10) ACTIVITIES NOT ADEQUATELY DEFINED

Fig. 6. He pushes the "3" and "XMIT" keys for manufacturing
classifications since a brick factory is a manufacturer.

INDUSTRIAL CLASSIFICATION 3 MANUFACTURING

For subclasses, push the number then the "XMIT" keys

- (1) FOOD BEVERAGES AND TOBACCO
- (2) TEXTILE, WEARING APPAREL AND LEATHER
- (3) WOOD, WOOD PRODUCTS, FURNITURE
- (4) PAPER, PAPER PRODUCTS, PRINTING AND PUBLISHING
- (5) CHEMICALS AND CHEMICAL, PETROLEUM, COAL, RUBBER AND PLASTIC PRODUCTS
- (6) NON-METALLIC MINERAL PRODUCTS EXCEPT PETROLEUM AND COAL
- (7) BASIC METAL INDUSTRIES
- (8) FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT
- (9) OTHER MANUFACTURING INDUSTRIES

Fig 7. User pushes "6" and "XMIT" keys for non-metallic mineral product classifications.

INDUSTRIAL CLASSIFICATION 36 MANUFACTURE OF NON-METALLIC MINERAL PRODUCTS

For subclasses, push the number then the "XMIT" keys

- (1) POTTERY, CHINA AND EARTHENWARE
- (2) GLASS AND GLASS PRODUCTS
- (9) OTHER NON-METALLIC MINERAL PRODUCTS

Fig. 8. User pushes "9" and "XMIT" keys for other product classifications, since bricks do not fall in any other classification.

INDUSTRIAL CLASSIFICATION 369 MANUFACTURE OF OTHER
NON-METALLIC MINERAL PRODUCTS

For defination, push the number then the "XMIT" key

- (1) STRUCTURAL CLAY PRODUCTS
- (2) CEMENT, LIME AND PLASTER
- (9) NON-METALLIC MINERAL PRODUCTS NOT ELSEWHERE CLASSIFIED

Fig. 9 For a definition of classification 3691 manufacture of structural products, to verify the classification is correct, he pushes the "1" and "XMIT" keys.

INDUSTRIAL CLASSIFICATION 3691 MANUFACTURE OF STRUCTURAL
CLAY PRODUCTS DEFINATION

"The manufacture of structural clay products such as bricks, tile, pipe, crucibles, architectural terracotta; stove lining, chimney pipes and tops; and refractories".

to return, push the "XMIT" key

for another classification, push "A" then "XMIT"

Fig 10. After verifying that the classification defined is correct, the user returns to the main program by pushing the "XMIT" key. The last four steps of this process could be used in a new industry licence input program.

ATTACHMENT 2

Computer System Structures - Central Versus Network

Uncoordinated development of separate computer systems by different units of an organization can create substantial problems. Many different types of equipment may be installed multiplying maintenance problems and stretching limited programming capabilities. An even more difficult problem arises if independent computers cannot communicate with each other. If, as is almost always the case, some information is used by more than one system, inconsistency is certain; different errors occur in the different systems, corrections and changes are made at different times.

These same inconsistency problems can occur in a single computer if applications are programmed as "stand alone" or independent systems. (see Attachment 3).

Until very recently the only feasible solution was a single central computer using data base information storage techniques and possibly with terminals having little or no computing capability.

Complete centralization often provokes serious complaints; users may feel that the system is awkward and inconvenient to use and inflexible, they may feel that it is unresponsive to their needs. In fact the computer organization's priorities may differ considerably from the users' priorities resulting in intolerably long delays in implementing needed applications.

The recent development of microprocessor based equipment has added a third viable alternative computer system structure:

a processing network composed of a central mainframe computer linked to "work station" terminals that have their own limited computing, storage and printing capability. Such terminals can perform some tasks locally such as editing and verifying inputs, word processing, limited calculation and can unburden the central computer of many overhead "housekeeping" functions. Such terminals can communicate with more than one computer in ASCII as well as EBCDIC, and can display and print information in both English and Arabic.

Extensive computations and data bases containing all information used by more than one organizational unit normally are taken care of by the central computer. The central data bank provides co-ordination where it is necessary yet the network allows separate use of the terminals when local control is desired.

ATTACHMENT 3

Data Base Concepts

Data base is a type of computer file design and cross referencing method for information storage. In a data base, each item of information is stored only once. Any program needing information must locate it by means of the cross referencing.

This is different from the older approach of writing unrelated programs with separate files to perform different functions. These files normally group together items of information that are related in one program. Other programs may use many of the same items, but grouped differently - for which different files are created. The same information items are recorded in many different files used by different programs at different times.

When an information item is updated (changed to a new value) or corrected to eliminate an error, this change should generally be made in every file in which the item is recorded. Writing programs to take care of this automatically is usually not feasible. Relying on people to coordinate changes invites problems.

In an organization of any size and complexity using multiple files, problems of data inconsistency occur that are practically impossible to control. The results can be difficult to excuse and require large amounts of time to correct. The following examples are intended to explain the nature of such problems:

An employee was called back from his vacation work on an urgent job. He filled out a time card for the day that charged his time as direct labour to the job. The personnel department records showed that he was on vacation and charged his time to overhead. The accounting department could not balance labour costs with payroll costs - so someone had to find the error and correct it.

I saw a case in which paychecks were automatically deposited to bank accounts of employees who had terminated and left the country. The money was difficult to recover - impossible in some cases - and very embarrassing to the accounting department and computer centre. The next month the same thing happened.

The data base approach does not maintain separate files sequenced for different programs. Each information item is recorded only once in a record that also lists which record will come next for almost any sequence a program could call for. When information is updated or corrected it is current and correct for all programs that use it subsequently.

Diagram 1 is an illustration of how the data base concept might be applied. Industrial and commercial registration information is used merely to give familiarity - it is not a suggested design, only a simplified explanation.

In the diagram industrial company records each contain a company name, address, telephone number and other information that is unique to the company. The names of the people who own stock, are officers or are authorized to sign for the company are recorded in a separate set of people records (because the same person may own stock in more than one company, etc.) but the company record shows which people

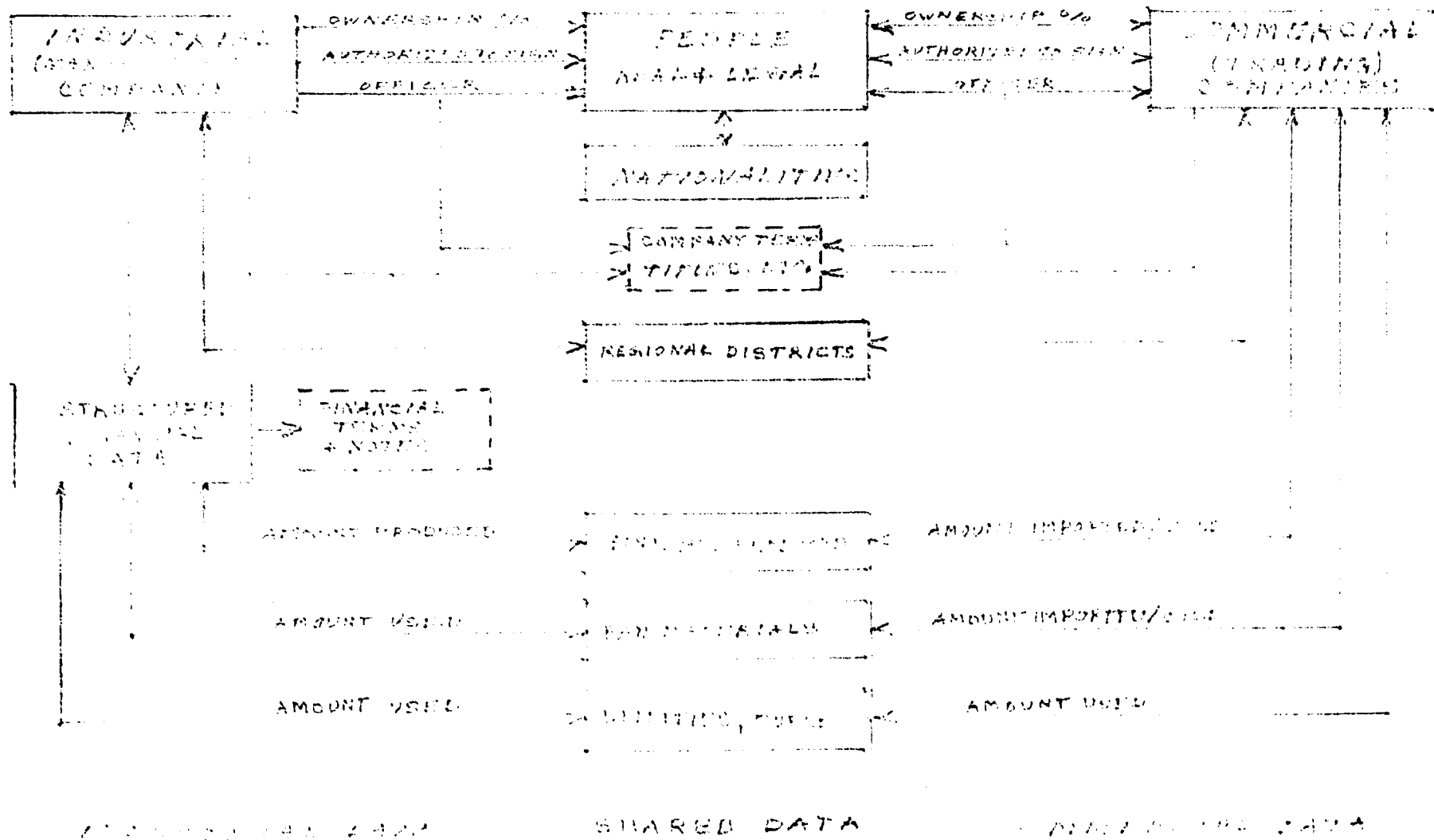


DIAGRAM 1. Unified commercial/industrial data base example

records contain the correct names. The people records contain the name, address and personal information and indicate which nationality record contains the right country name as well as which company records show names of companies he owns, signs for, etc. The nationality records contain the name of a country and show which people records show that nationality. Arrows on the diagram show this relationship between different types of records.

With the relationships shown, company names could be listed alphabetically with owners names and nationalities. Equally well, nationalities could be listed giving the names of the nationals and the companies they own and the products. Or, for each region, for each product type companies that produce or import it could be shown and how much they produce.

ATTACHMENT 4

Word Processing

Word processing is computer aided text writing. It reduces the effort required to draft, edit, redraft, revise and finish type reports, contracts, letters or almost any text. A word processor is a microcomputer programmed to perform these functions. Although different models of word processor systems differ somewhat they all perform the majority of the functions described below and may include others.

Text is entered at a typewriter-like keyboard and displayed on a cathode ray tube (video) screen. The rough draft is input as quickly as possible without regard for errors. After the text has been typed in, it can be inspected on the video display screen. Any errors noticed at this time can be corrected quickly by positioning the cursor (bright spot on the screen that shows where the next character will go) over the error and typing the correction. The newly typed characters replace what was there. Words left out can be inserted with the following text automatically moving over to make room. Words can be deleted similarly. When the text is satisfactory it can be recorded for later use. This process is faster than normal typing.

After input, a draft copy is printed on paper automatically at more than four hundred words per minute. Review of the draft usually indicates needed corrections, revisions or rearrangement. These changes can be made without re-entering any text already recorded.

A number of text editing functions simplify the task of

changes. The computer can search for a particular sequence of characters and display them, replace them or insert something after them. For instance, a word misspelled in several places can be located and changed to the correct spelling at each occurrence automatically. Sections of text can be moved from one place to another. These editing functions make retyping unnecessary.

When the text has been edited to satisfaction the word processor can print it automatically in final form. The printing format can be set at this time with considerable flexibility. Type size, style and line spacing can be changed over a wide range. Margins can be set and the computer will print all the words that will fit each line without dividing a word (unless specifically allowed to by showing where words can be divided by including "soft hypens" in the spelling). The computer can justify the printing by putting variable space between words or letters so that all lines are the same length, as in most books. Pages can be numbered automatically. Headings, footnotes, subscripts, superscripts can be printed and many other functions. Some word processors will automatically produce an index. The printer can be equipped with a sheet feeder that will automatically feed new sheets of paper as pages are finished.

The text is recorded on "floppy discs", small removable magnetic recording packages about 20 cm x 20 cm x 1 mm, or on magnetic tape cassettes on older designs. A floppy disc will record between 50 000 and 200 000 words of text. These recordings can be saved so that copies can be printed later or sections from one document can be inserted into another, eg. standard contract clauses can be inserted into a new

contract. The recordings can be erased and reused.

Any word processing system has the elements of a computer: central processing unit, memory, keyboard, display, storage and printer. Programs have been written for most computers, large and small, so that they will function (with varying degrees of utility) as word processors. The two word processor machines in Oman Development Council are micro computers with a fixed program that does not permit other uses. The same elements, with different program software, could serve alternatively as a terminal to large computers, as a general purpose micro computer or as an automatic telex station,

Word processing systems are not all equal. The value is sensitive to design factors that determine the capability, convenience and simplicity of use and to the location of its elements.

ATTACHMENT 5

INFORMATION REQUIRED FROM THE COMPUTER
CENTRE IN THE DIRECTORATE GENERAL OF
FINANCE.

PURPOSE: "To study the existing computer facilities and investigate their compatibility with project evaluation/control programmes internationally available, as well as their better utilization for some other managerial fields."

For this study the following types of information would be helpful:

1. Capabilities of the terminal network, being installed at the DGI and possible enhancements: baud rate and distance limitations, transmission modes, expected response times, alternate character sets, etc. Access to technical manuals of the multiplexer, modems, controller, terminals and printer would be a great help.
2. The design specifications and description of the Commercial Registration data system: file structures, field descriptions, keys, linkages, query modes, file security, backup, etc.
3. Whether and under what conditions the computer Department could provide: on line text editing and formatting (word processing), perhaps the I B M Text Processing programme ATMOS DOS/VS (is description available?); interactive BASIC language on line; project planning, simulation and reporting programmes (descriptions of PLACODL I DOS/VS and PROJACS DOS/VS would be helpful).
4. General operating system, language and file capabilities of the system, eg. whether files created in any language are accessible in all others. Access to the appropriate manuals (CICS, COBOL, etc. would help).

ATTACHMENT 6

December 9th 1980.

Mr. L. Biritz, Head
Factory Establishment and Management Section,
Division of Industrial operations,
UNIDO P.O.Box 300,
A-1400 Vienna,
Austria

Ref:SI/CMA/80/802

Dear Sir,

I would appreciate your assistance in obtaining some information or value to this project. The most critical item is the technical description of project evaluation programs, since Project Activity No.2 states: " Study the existing computer facilities and investigate their compatibility with project evaluation/control programmes internationally available....."

As Mr. Suzuki suggested at my briefing, I have been attempting to obtain this information through private channels, but so far without success. The rather severe time constraints of this project make this matter urgent. Attached is a description of the information desired.

Also attached is a request for clarification of the information services available from the UNIDO Industrial Inquiry Service and the Industrial and Technical Information Bank. This information will help establish the potential benefits to the Oman Ministry of Commerce and Industry from these UNIDO functions. I would appreciate your channeling of these requests.

Yours sincerely,

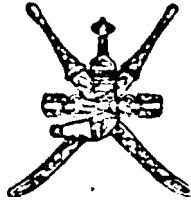
Andrew Yeiser, Expert
C/o. Ministry of Commerce & Industry
P.O.Box 550,
Muscat,
Sultanate of Oman

cc: H. B. Danisman, Res. Rep.

SULTANATE OF OMAN
DIRECTORATE GENERAL OF FINANCE

P. O. BOX 506 - MUSCAT

TEL. : 745201



سلطنة عُمان

الديرة العامة للمالية

ص.ب ٥٠٦ - مسقط

هاتف: ٧٤٥٢٠١

Mr. Geisler
D. J. Geisler

117

No. : FC/75/22

الرقم :

Date: 9 January 1981

التاريخ :

Director General of Industry
P.O.Box 550
Ruwi

After compliments,

I refer to your letter reference 142/80/6851 dated 29th November, 1980 enclosing a list of the information requirements of your U.N. Consultant. I give below my responses and comments:

Item 1. The terminal controller being installed will cope with upto 7 additional units - at present 5 are planned, 3 terminals and 2 printers; the transmission rate via the modern link will be 2400 bps; as the terminals are to be installed for remote operation there is virtually no distance limitation; transmission mode is to be BSC; anticipated response time around 5 secs. Your consultant is welcome to study any available manuals and I would suggest he discuss the network characteristics with the IBM Engineer who can be contracted on 602398.

Item 2. (Below is a general response to the questions from my Senior Systems Analyst).

General Description

Data of 10,000 Business units (companies, individual traders) already registered with Commercial Registration Section of Directorate General of Commerce will be transcribed on to new Registration Application forms which will be set up on Computer files (DASD) after keying through IBM 3742 Diskette machines and proper validation.

All new applicants will fill-in new application forms and after approval from the Directorate General of Commerce, the required information will be fed to computer through remote terminals.

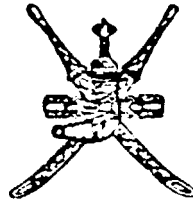
SULTANATE OF OMAN

DIRECTORATE GENERAL OF FINANCE

P. O. BOX 506 - MUSCAT

TEL. : 745201

سلطنة عمان



سلطنة عمان

المديرية العامة للمالية

ص.ب ٥٠٦ - مسقط

هاتف: ٧٤٥٢٠١

- 55 -

- 2 -

No. :

الرقم :

Date :

التاريخ :

All enquiries and updates to the information set up in computer will be directed through the terminals while 8 Output printed (batch) reports will be produced as per request from the Directorate General of Commerce.

File Structure

All files (around 7) are VSAM KSDS files organized in a similar way as a Data Base and are linked to one another through pointers/keys.

Field Descriptions

1. Company file

- Registration Number (KEY)
- Registration Date
- Company Name
- Legal type
- Trade Mark
- Head office Location
- Head office Address
- P.O.Box.
- Telephone Number
- Date of Establishment
- Duration
- Capital
- Licence No.
- Licence Date
- Application Date

2. Personnel file

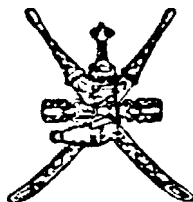
- Registration No.) (KEY)
- Personnel Code)
- Name
- Designation
- Authorisation for signatures Code
- Authorisation Duration

SULTANATE OF OMAN

DIRECTORATE GENERAL OF FINANCE

P. O. BOX 506 - MUSCAT

TEL : 745201



سلطنة عمان

المديرية العامة للمالية

ص.ب ٥٠٦ - مسقط

هاتف: ٧٤٥٢٠١

- 3 -

- 3 -

No. :

الرقم :

Date :

التاريخ :

- Authorised Amount
- Share in Capital
- % share in Capital
- Registration No. of other Business
- Date of Birth
- Place of Birth
- Nationality
- Passport Number
- Date of Issue
- Place of Issue
- Date and way of acquiring nationality
- Permanent Address

3. Branch file

Almost like Company file

4. Trades file

- Registration No.) (KEY)
- Trade Code)
- Trade capital

5. Area file

- Registration Number) KEY
- Area Code (Serially))
- Area Code (Operation Area)

6. Trade/Country/Area Name file

- Trade/Country/Area Code (KEY)
- Trade/Country/Area Name

7. Changes file

- Registration No.) (KEY)
- Field Code)
- Field Contents (Previous)
- Date on which field was changed.

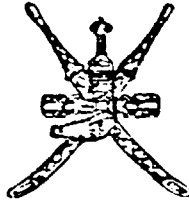
SULTANATE OF OMAN

DIRECTORATE GENERAL OF FINANCE

P. O. BOX 505 - MUSCAT

TEL : 745201

سلطنة عمان



سلطنة عمان

الديريّة العامة للمالية

ص ب ٥٠٦ - مسقط

هاتف: ٧٤٥٢٠١

- 37 -

- 4 -

No. :

الرقم :

Date :

التاريخ :

File security

Since all files are VSAM files, the security facility is provided by VSAM itself using passwords at different levels and the operating system CICS also has its security levels.

Back-ups

Regular back-ups are to be taken on magnetic tapes and stored in a fireproof safe.

Item 3. IBM advise that their Text processing equipment is not announced (i.e. not available) in our area; we do not have any manuals on Atmos DOS/VS, PLACODE I DOS/VS or PROJACS DOS/VS but these may be available from IBM Dubai; it is intended to recommend the acquisition of interactive hardware and software program development facilities which may include BASIC but this has not yet been decided and in any case would not be available before the last quarter of 1981.

Item 4. Our operating system is DOS/VS, Rel:34 and for teleprocessing, CICS/VS Rel 1.4; ANS COBOL, FORTRAN IV, RPG II & Assembler currently available; files created for access by a particular language are generally accessible by other languages - for example CICS/VS supports ANS COBOL, PLI, RPG II and Assembler and VSAM (the access method for Commercial Registration files) Supports PLI, ANS COBOL and Assembler.

I would re-emphasise that the U.N. Consultant is welcome to study any of the technical manuals available in my department and to discuss any of his problems with my staff on the lines of the detailed discussions he had with me some weeks ago.

Regards,

G. W. Wood
Director
Computer Department

ATTACHMENT 7

REQUEST FOR INFORMATION
ON
PROJECT EVALUATION COMPUTER PROGRAMS

UNIDO project SI/OMA/80/802 requires information describing all computer programs for the financial evaluation of projects that are internationally available. The program designed and being implemented by the UNIDO Feasibility Studies Section should be included, if possible.

The technical descriptions should be as detailed as possible, and in addition to descriptions of the functions and uses of the programs. (eg. provisions for sensitivity analyses) should include the following specifics, if possible:

1. Computer system requirements-computer type, operating system, language, memory, storage, and I-O devices.
2. Input mode (whether interactive or batch), input format and forms if any.
3. Output report descriptions and sample forms, if possible.
4. How the program can be acquired.

This information is urgently needed. To be of value to the project replies should be received before 10th January 1981. Please address replies to:

A. Yeiser , UNIDO Expert
C/O. Ministry of Commerce & Industry,
P.O.Box 550,
Muscat,
Sultanate of Oman.

ECCETZ

0

ET

PNUJROK WUS785 CUB110 NCLF044 VIL0205
 NDUU HL UNNY 131
 VIENNA 131/124 7/1 0940 PAGE01/50

LT

UNDEVPRO
 NUCCAT

ORADO DANISHMAN FOR YEISER FROM DIGITE 01/00A/00/000 DECELOT 0
 DECEMBER AAA UNIDO PROJECT EVALUATION COMPUTER PROGRAMME DUE TO BE
 COMPLETED JUNE 1981. AT THIS STAGE FOLLOWING INFO AVAILABLE:
 PROGRAMME RUN WITH MINICOMPUTER WRITTEN BY FORTRAN IV SEMICLN
 INTERACTIVE MODE USED FOR INPUTS SEMICLN OUTPUT PLANNED ALONG LINE
 OF UNIDO MANUAL

COLL 00430 01/00A/00/000 0 1981.

CUB110 UNDEVPRO PAGE02/50

(19206) SEMICLN REQUIRED CPU FOR PROGRAMME AND
 OTHER HARDWARE REQUIREMENTS NOT SPECIFIED YET SEMICLN UPON
 COMPLETION PROGRAMME POSSIBLY DELIVERED FREE OF CHARGE BBS
 UNIDO INTIB UNABLE ACCESS TO CCIC ON LINE STOP DESCRIPTION OF
 CLASSIFICATION SYSTEM ANEKEY WORD THECAURUS WILL FOLLOW BY POUCH
 CCC THREE SPECIFIC INQUIRIES WILL BE ANSWERED

COLL (19206)

CUB110 UNDEVPRO PAGE03/21

THROUGH INDUSTRY
 SERVICE STOP UP LAFORE WILL FOLLOWUP BBS AND CCC (INT/00 UNIDO
 VIENNA)

COLL 00430 01/00A/00/000 0 1981 19206

=01071015

COLL 00430 01/00A/00/000 0 1981 19206 =01071015

ATTACHMENT 8

REQUEST FOR SPECIFIC INFORMATION
ON THE
UNIDO INDUSTRIAL AND TECHNOLOGICAL INFORMATION
BANK (I N T I B)

A current UNIDO project (SI/OMA/80/802) is working to improve the project evaluation capabilities of the Directorate General of Industry in Oman. One of the recommendations may be to implement an on-line terminal query facility linked via telephone modem to the Industrial Data Bank of the Gulf Organization for Industrial Consulting (GOIC) and through them to other industrial data banks in America.

Is on-line access to the INTIB possible or planned?
Is there a description of the classification system or key word thesaurus to help formulate inquiries?
Are there other ways in which rapid response might be elicited?.

I would appreciate suggestions as to how the greatest benefit from INTIB might be obtained by the directorate. To be of value to this project, replies should be received before 10 Jan 1981.

Please address replies to:
A. Yeiser, UNIDO Expert,
Ministry of Commerce & Industry, DGI
P.O. Box 550, Muscat,
Sultanate of Oman



UNIDO

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

VIENNA INTERNATIONAL CENTRE

P.O. BOX 300, A-1100 VIENNA, AUSTRIA

TELEPHONE: 26 310 TELEGRAPHIC ADDRESS: UNIDO VIENNA TELEX: 135612

REFERENCE: Industrial and Technological Information Bank (INTIB)
INTIB/11333/lr (please quote) 8 January 1981

Dear Mr. Yeiser,

In reference to your letter dated 9 December 1980 to Mr. Biritz, which was forwarded to us the 6th of January, we are very pleased to give you information concerning access to INTIB and the Inquiry Service.

The Inquiry Service and INTIB are normally accessible by mail simply by describing the technological problems, as you did for your inquiries concerning ice making, batteries and building materials. Requests should be addressed to INTIB giving as many details as possible on the information problem itself, so that an answer to the real question can be provided. It is also important to mention what information is already available to avoid receiving documentation which you already have. Requests can also be made by telex.

With regards to on-line access of INTIB, only a part of it has been computerized so far. The abstracts of UNIDO documents could possibly be accessible on-line, but we have not seen enough interest so far to provide this facility. Normally, print-outs are provided upon request and it takes two days to send them. Then the documents have to be ordered if not easily available in the country. Access to the other INTIB data bases will not be advantageous now as they are still at the development stage.

For the data base of UNIDO documents, we provided copies of the tape (free of charge) to five countries now, but computers using ISIS soft-ware or MINISIS (developed by IDRC, Canada) has to be used.

The retrieval of information can be made using the UNIDO thesaurus or by free texts searching with the computer. The thesaurus is presently out of print and is being revised. However, we will send you shortly a computer listing of the key words.

Mr. Lafond will be pleased to see you during your debriefing in Vienna to discuss this matter and, if necessary, by correspondence beforehand.

Yours sincerely,

for G.S. Gouri
Senior Technical Adviser
UNIDO Technology Programme

Mr. A. Yeiser, UNIDO Expert
Ministry of Commerce and Industry,
DGI
P.O. Box 550, Muscat
Sultanate of Oman

ATTACHMENT 9

REQUEST FOR SPECIFIC INFORMATION
ON THE
UNIDO INDUSTRIAL INQUIRY SERVICE

A current UNIDO project (SI/OMA/80/802) is working to improve the project evaluation capabilities of the Directorate General of Industry of Oman. It is difficult for the limited staff to ascertain whether technology and equipment are available that are superior to or more appropriate than that specified in a particular application for an industrial licence. The risk is that inferior, marginal or non-competitive industries may be developed because the staff cannot possibly have expert knowledge of recent developments in every specialized field of technology.

I would like a determination of the extent to which the Industrial Inquiry Service might prove useful for this purpose so that its use might be recommended as applicable.

To make this assessment more specific, three current questions are cited below that can be considered typical of the diversity and general nature of the problem.

1. Several applications for permits to build small scale (5 to 100 T/D) ice manufacturing plants specify ammonia as the refrigerant. In order to judge whether this represents the most appropriate and competitive technology the following information would be helpful:
comparing ice making refrigeration equipment, using different refrigerants including ammonia and various freons:
 - a) comparative costs- original equipment cost, operating cost, maintenance cost.
 - b) A list of vendors of such equipment.
 - c) Whether the operation or maintenance of any particular type of equipment requires higher skill levels than the others.

2. An application has been received for a permit to build a plant to produce distilled water and acid for automotive storage batteries (accumulators). The market analysis in the application takes no account of the possible impact of recently developed, permanently sealed (no maintenance) batteries.
Are permanently sealed storage batteries likely to enter the Arabian Gulf market? If so, when and to what extent?

- Pg 2 - Cont.

3 Various small scale building materials manufacturing industries are being considered for active promotion. Among them is the high pressure moulding of items such as structural building elements, street curbs, floor tiles, etc. etc.

Information needed includes manufacturing processes, machinery, raw materials selection and physical properties of the product.

I would appreciate receiving an assessment of the ability of the Industrial Inquiry Service to questions of these types, and if possible, answers. To be of value to this project replies should be received before 10 Jan 1981.

Please address replies to:

A. Yeiser, UNIDO Expert,
Ministry of Commerce and Industry, DGI,
P.O. Box 550,
Muscat
Sultanate of Oman

ATTACHMENT 10

BIBLIOGRAPHY OF SELECTED AMERICAN
PUBLICATIONS ON FEASIBILITY STUDIES

- Baranson, J. Industrial technologies for developing countries, Praeger, New York, NY, 1969.
- Lester, J.M. Technology transfer and developing countries: a selected bibliography, George Washington University, Washington, D.C. 1974.
- Lewis, W.A. Development planning, Harper and Roe, New York, N.Y. 1966.
National Aeronautics and Space Administration, Washington D.C. Technology transfer: a selected bibliography, Rev. ed., 1971.
- Parsons, R. Statistical Analysis: a decision-making approach, Harper and Roe, New York N.Y. 1974.
- Reutlinger, S. Techniques for project appraisal under uncertainty, World Bank Staff Occasional Papers NO.10, Johns Hopkins, Baltimore MD, 1972.
- Siocum, D.H. New venture methodology, American Management Association, New York NY, 1972.
- Solomon, M.J. Analysis of projects for economic growth, Praeger, New York NY, 1970.
- Tucker, S.A. The break even system, Prentice-Hall Englewood Cliffs NJ, 1973.
United States Agency for International Development, Office of Engineering, Washington DC, Feasibility analysis procedures manual, 1976, Handbook 3: Project assistance, cost estimating procedures manual, 1976.
- Vander Tak and Squire, L. Economic analysis of projects, IRBD Staff Working Paper No.194, World Bank, Washington DC, 1975

OTHER FEASIBILITY STUDY PUBLICATIONS

- Alfred, M. and Evans, J.B. Discounted cash flow principles and some short cut techniques, Chapman and Hall, London, 1973,
- Pilcher, R. Appraisal and control of project costs, McGraw-Hill, London, 1973
- Weiss, D. Economic evaluation of projects; a critical comparison of the new World Bank methodology with the UNIDO and OECD approach, German Development Institute, Berlin, 1976.



