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REGIONAL ARAB PROGRAMME FOR THE
DEVELOPMENT OF SUB-CONTRACTING

DP/RAB/86/001

Technical report: computerization of the programme,
including user's guide to the United Nations Industrial
Subcontracting System (UNISS)
and proposals for a system of communication *

Prepared for the Governments of
Algeria, Egypt, Iraq, Jordan, Morocco and Tunisia
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Mr. A. Spina,
Expert - System Analyst

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United Nations Industrial Development Organization
Vienna

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* This document has not been edited.

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Annexes

I. DEVELOPMENT OBJECTIVES

The development objective of this project is to promote cooperation between complementary industrial production units by optimizing the use and allocation of existing industrial capacities with a view to encouraging Arab integration in this area at both the national and regional levels and, further, to contribute in this way to the integrated and harmonious industrial development of the region.

Objectives

The primary objective of this project is to supply national subcontracting projects with the necessary instruments which will assist in the establishment of subcontracting exchanges (SCX) in each of the participating countries. Among these instruments, the most relevant to the expert's assignment would consist of the following:

(a) A common methodology for the rational organization of subcontracting programmes and the establishment of SCXs;

(b) A common classification or industrial nomenclature along with common terminology;

(c) A common compatible computerized software which will reflect the common methodology.

The secondary objective, one which can only be realized after the primary objective is met, is the establishment of a computerized Arab network of industrial SCXs.

Expert's objectives

It had been agreed by all of the participating countries that the above-mentioned instruments would first be tested in the Tunisian SCX and that the availability of results of applied testing in this pilot country would be circulated to all concerned. Furthermore, countries using the established common methodology, classification scheme and software (UNISS - United Nations Industrial Subcontracting System) will easily be integrated into a computerized regional Arab network, providing links both at the regional and international levels. It was also agreed that the United Nations Industrial Development Organization (UNIDO) headquarters would, for the initial start-up period at least, be considered the focal point for centralizing all activities relating to software development (UNISS) and for the co-ordination and exchange among participating countries of information gathered by the national SCXs.

A chapter in this report deals with the various options presently available for accomplishing the transfer of computerized data between National SCXs. However, networking systems are dependant on many factors. The most important of them all is the local PTT installations. Because of this factor, to attempt to go into too much technical detail regarding its feasibility would require a country by country assessment.

II. BACKGROUND

1. In June 1986 a preliminary meeting was held in Paris where several of the key players involved in either the Regional or National projects were present. Project objectives were reviewed and target dates set for their potential achievement.

One of the participants in this meeting was a French-speaking computer
expert, Mr. Operiol, who had worked on the development of a software called
SOUTRAITEL. Mr. Operiol and I looked into the possibility of using SOUTRAITEL
for the Arab Regional project. It was quickly discovered that this software
would not satisfy the needs of the SCXs which were to be established. It
should be pointed out that this was the situation at the time. Whether it has
been modified to do so today is not known. Mr. Operiol was therefore contracted
to undertake the computer analysis and programming work which was required.
This task was to be overseen by myself, in consultation with Mr. Cuny, the sub-
contracting expert assigned to the Tunisian SCX.

Mr. Cuny stated at this meeting that the questionnaire which had been used
in setting up the Bourse de Sous-traitance de l'Est was still valid, and that
Mr. Operiol could begin to programme the software based on that layout. A six-
week contract was issued in order to accomplish the work.

2.   In October 1986 I had scheduled an initial mission to Tunisia to install the
first release of the software which would be picked up in Paris en route to Tunis.
The software was thoroughly tested in Paris with Mr. Operiol and found to be
acceptable, as it corresponded to the questionnaire layout as supplied by the
subcontracting expert. Upon arriving in Tunis, the software was demonstrated to
the staff of the national counterpart institution, "Agence de Promotion de
l'Industrie" (API) and to Mr. Cuny.

3.   However, between the period of June and October 1986, Mr. Cuny had under-
taken several missions to Tunisia. These initial missions brought out several
points which made it necessary to modify the questionnaire. Indeed, the modifi-
cations were such that it became quite obvious that this first version of the
software would have to be re-designed and re-written. Since API's staff was at
that time (1986) familiar neither with microcomputers nor with dBASE and Clipper
(commercial software packages used for developing application systems), it was
agreed to hire a locally-recruited programmer, from Regional Project funds, to
carry out the necessary software modifications.

While the suggested programmer's contract was being finalized, he was offered
a one year scholarship to study in France. A suitable replacement was quickly
found, and the programming work got under way. However, for some unknown reasons,
this locally-recruited programmer was unable to work with the API staff. His
contract had to be prematurely terminated. This was an unfortunate turn of
events, since the software was almost complete. What was still outstanding was a
thorough testing of what had been installed at API. In order to maintain the good
working relationship so far enjoyed with API management, it was agreed that another
programmer, the third to touch this software, would be recruited to undertake the
testing and eventual corrections to the delivered software. This one problem was
responsible for a six months' delay in the timely delivery of the software.

4.   In order to expedite matters, this third programmer was locally recruited in
Vienna. Given the nature of programming work, and what was left to be done on
the UNISS software, work proceeded at a much slower pace. It is a well-known fact
that any programmer trying to 'debug' another programmer's work has to go through
a painful familiarization process which involves trying to understand how the other
programmer's logic flows.

5.   The questionnaire in the meantime went through several more refinement stages.
These modifications meant that more changes would have to be made to the existing
software. In actual fact, the questionnaire was only finalized or frozen in early
1988 when several of the experts, working on either the national or regional projects,

were, at the same time, on debriefing missions in Vienna. These experts consisted of Mr. Ghosh (subcontracting expert on RAB project, assigned to Egypt), Mr. Bouyer (subcontracting expert on RAB assigned to Morocco), Mr. DeMars (nomenclature expert on RAB), Mr. de Crombrugghe (UNIDO backstopping officer) and myself (informatics expert). The questionnaire, together with the different nomenclatures, were thoroughly reviewed, and several more changes and recommendations ensued from these intensive two-day meetings. Even at this writing, the questionnaire cannot be said to be perfect, but as the project has come to an end, this version together with Version 4.0 of UNISS should be considered as the final output of this Phase I.

Feedback from the established exchanges is still hoped for. These comments or suggestions could be incorporated into a later version should a Phase II be agreed upon.

6.   At this point in time, only the Tunisian and Egyptian national projects have received Version 4.0 of the subcontracting software. An attempt was made to install UNISS for the Moroccan project, but given the inadequate configuration of the microcomputer at the Chambre de Commerce de Casablanca, it was not possible to get the system to function. Those countries which are still awaiting official ratification of their national SCXs will receive the subcontracting software once they become functional. However, the experience gained from the operational SCXs will greatly benefit those national projects which have met with unfortunate delays.

7.   The reader should bear in mind that the Tunisian SCX had been selected as the pilot project for testing the various tools developed by the different experts. The successive or corrected versions of the software were always promptly delivered, installed and demonstrated to API staff members. API staff briefly tested Version 3 and did report a difficulty having to do with memory allocation. This problem was quickly resolved. However, during my last visit to API, in June 1988, I was informed that they had written their own subcontracting software. Their version was, out of courtesy, reviewed with them and found to be, in appearance at least, similar to UNISS. The two major differences I could see were, first, that their software contained very little validity checking. Second, the API version also eliminated all references to UNIDO as originator and developer of the system concept. It was neither stated nor implied that UNISS Version 3 was 100% bug-free, but what was often repeated was that all reported problems or suggestions would be immediately acted upon and the necessary corrections made and the modified software re-distributed.

Most of the problems encountered with UNISS, either by API staff or myself, tended to be of the following type:

   (a)   Actual programming problems (bugs) which did prevent the user from continuing with testing activities (these were very few, and then only in the earlier versions of UNISS);

   (b)   An API staff member or an outsider having access to the computer had modified some DOS system files which UNISS needed. This happened on several occasions, and each time the operating system was re-configured and the corrections were explained to API staff;

   (c)   Improper handling of the microcomputer hardware was also responsible for several hardware malfunctions which could be misconstrued to be software difficulties;

   (d)   The computer operator or user of UNISS did not fully understand what an SCX is or how it is to function. This led co thinking that the software was at fault, whereas in reality it was the erroneous user concepts which were to blame.

It must, however, be said again that when problems were reported to UNIDO headquarters, API staff were, when possible, given the necessary instructions on how to overcome their difficulties.

8. Version 4.0 of UNISS is the final version of the subcontracting software which will be delivered under Phase I of this project. Some minor modifications or enhancements could still be undertaken, but no problems exist, none which are known, which prevent the software from being utilized as the <u>tool</u> for which it was meant. Programming problems aside, the only way in which any version of UNISS could be considered as being final would be to do the following:

(a) Freeze the questionnaire and allow absolutely no changes or enhancements to be made. This is equivalent to saying that the questionnaire is perfect and that it will hold for an indefinite period of time.

(b) The nomenclatures used would also not be subjected to any changes. This point is already false, since as of early 1988 a new harmonized system of product classification and description has been announced and released by the European Economic Community. The subcontracting methodology and working tools, including UNISS, use several of the EEC nomenclatures. This new classification system will eventually have to be incorporated into the SCXs' tools; otherwise, communicating with European exchanges and companies will prove to be difficult.

(c) On the programming side, it is impossible to demand or expect that any software which consists of over 6,000 lines of user coding and over 30 different databases will not have certain "bugs" which will arise every once in a while no matter how careful or thorough the testing has been. One only has to look at commercially available software where new versions are released almost every four to six months. dBASE III software, used in developing UNISS, has gone through many releases since it first appeared. Today, we have dBASE IV version 1.1 with the PLUS version due in the fall of 1989.

III. RECOMMENDATIONS

Several crucial steps have yet to be taken, at least with respect to the computer-related activities of Phase I of the Regional Arab project. In order to ensure that the work started in this initial phase continues in an orderly fashion, several points should be taken into account before labeling DP/RAB/86/001 "operationally completed". They are here divided into two categories: country- and UNIDO headquarters-related activities.

<u>Country</u>

(a) The common methodology and nomenclatures used within the framework of the Arab Regional project should be adhered to by all participating countries.

(b) The classification scheme developed should be faithfully applied by all in order to facilitate future communication.

(c) The countries should place more emphasis on gathering the necessary subcontracting information rather than on the computerization aspect of the SCX.

(d) The software (UNISS) should be adopted as the basic computerized tool for storing and retrieving the collected subcontracting-related information.

United Nations Industrial Development Organization

(a) In general, it is imperative that UNIDO plan for continued technical assistance within a Phase II for refinements and possible corrections to the various tools developed for running an SCX.

(b) More specifically, the software (UNISS) could use more testing and feed-back from the various sites where it has been implemented. Also, as has already been stated, bugs will continue to appear. In general, UNIDO technical assistance projects have developed software for one reason or another. They would also need improvement, debugging, software installation assistance and training. It would be most practical for all these projects to have one or two people at UNIDO headquarters who would undertake such activities.

(c) Algeria, Iraq and Jordan have yet to launch the first phase of their National subcontracting exchange. In order to ensure that these last three get the same initial help the others have received, some post-RAB technical assistance will have to be considered or included in a possible Phase II.

(d) The computerized networking of the various SCXs is still outstanding. It is inconceivable that this activity be undertaken at this point. There are too few countries presently active in gathering the needed information, and those which are collecting the data have too little data to warrant electronic links with each other or with the international marketplace. This activity will have to be scheduled as an additional activity in the proposed second phase should the countries agree to one, and provided the money is found.

(e) Last but not least, a microcomputer will have to be secured for UNIDO headquarters so that points (a) to (d) above can be acted upon.

ANNEX I

USER'S GUIDE TO UNISS

1. Purpose of software

UNISS is the acronym for United Nations Industrial Subcontracting System. It was designed and developed as one of the components of UNIDO-executed project DP/RAB/86/001. It is a common compatible computerized software which reflects the common methodology used in setting up and running a subcontracting exchange (SCX). It was meant, and indeed, developed, as a tool elaborated in accordance with the methodology for satisfying the daily operational needs of an SCX. It could easily be argued that an SCX does not depend on computer assistance for carrying out its day-to-day tasks, but it is also an indisputable fact that a properly designed and maintained computer software will greatly assist in organizing the information and later in retrieving it much more quickly than a manual system would allow. The benefits of a computerized system will be fully realized when more enterprises are canvassed and recorded and interventions become more frequent. Therefore, a good technical person will, at the beginning, contribute more to the success of an SCX than any computerized tool.

2. About the system

UNISS and the related computerized nomenclatures are presently available in English, French and Spanish. The software can easily be adapted to most any other language because of the development approach used. The programmes which make up UNISS do not contain any language-sensitive text. All screen texts are stored in associated files and incorporated into the software logic whenever they are needed.

UNISS was written using dBASE III PLUS and Clipper Nantucket (Summer '87 Version). The user is supplied with an executable module (compiled coding) together with the necessary working files and databases. There is, therefore, no absolute requirement to have a copy of dBASE III, or Clipper, for that matter, stored on the user's microcomputer. Any errors or recommended changes should be reported in writing to UNIDO. Changes or corrections, if necessary and if possible, will be made, and a new release of the software re-distributed to registered users.

3. System requirements

The minimum system (hardware and software) requirements needed to run UNISS are as follows:

3.1 IBM XT/AT/386 (or compatible) with 640 kilobytes of main memory.

3.2 Any type of video monitor color or monochrome will work.

3.3 Fixed disk (or hard disk) drive with 20 megabytes or more of storage capacity (a fast disk, 28 milliseconds access time, is recommended for larger SCXs).

3.4 One floppy disk drive (360 KB, 1.2 MB, or 1.4 MB).

3.5 DOS (MS or PC-DOS) operating system (release 3.1 or higher).

3.6 RAM disk (Virtual Disk) of 64 KB or more depending on available random access memory (RAM). This must be configured as drive D on the user's system. Please refer to your DOS manual under the title "Device Command" on how to accomplish this assignment. For laptop computers (e.g., Toshiba), DOS operating system 2.11 will allow for the assignment of a RAM disk. Other utilities or software which perform similar functions are also available and could be used for this purpose.

3.7 The CONFIG.SYS file should have the FILES=20 and BUFFERS=20 parameters speci-
    fied. This is to ensure overall operating efficiency. However, as the number
    of enterprises entered into the system increases, these two parameters should
    be adjusted accordingly.

Optional system add-ons:

(1) The user can also make use of a feature called DISK-CACHE which reduces
    the number of physical disk accesses (I/Os) thereby making UNISS perform
    much better. Several utility-type software (e.g., PC-TOOLS) have this
    feature as an option. This is only optional, but if available, it is
    highly recommended.

(2) Although not a requirement, UNISS will also work with a mouse device,
    should one be available. However, given the wide variety of pointing
    devices available on the market today, it is left up to the user to
    provide the necessary mouse drivers. UNISS has been tested with several
    types of mouse systems (e.g., Microsoft, Genius, Logitech and Witty Mouse)
    and all have performed very well. Optional but recommended.

4. Gaining access

The software consists of two major operating components. The first component
deals with the administrative functions of UNISS, and the second with the daily
running of an SCX itself. At present, initial access to either part of the soft-
ware is achieved by typing at the DOS prompt the following commands:

(1) ADMIN - The administrative functions of UNISS are made available by
    typing this command.

(2) UNISS - The command UNISS when entered will give the user access to that
    part of the software which is used for the day-to-day running of an SCX.

Depending on the individual user's role in the SCX, access to some or all of
the operating functions could be denied to him. This is done for confidentiality,
security and data integrity reasons. There are three categories or levels of users.
Users should only be assigned the level of entry into the system which they need to
have in order to perform their normal functions. These three different levels are
as follows:

Level 1   Assigned to those users who run the SCX. They have access to all daily
           (entering, updating and scanning enterprise data records) subcontracting
           related functions.

Level 2   This level of user is restricted to search and browse type activities.
           Down-loading information to a printer is allowed; however, modifications
           or additions to data records is not permitted.

Level 9   This user, normally the person assigned as System Administrator, has
           access to all available functions, both administrative and subcontract-
           ing. This level should be assigned to a restricted number of users
           within the SCX.

Individual users will be assigned their own particular level of access by
either the System Administrator or the person responsible for subcontracting
activities within the organization. The actual commands necessary to accomplish
this user assignment of level is explained by the screen printouts in Appendix A.

The users of UNISS should also be made aware that every successful entry into
the system is automatically recorded into a file called WHO.dbf. Should the System
Administrator wish to examine who did what on which day, this file could be exam-
ined, using standard dBASE commands. Needless to say, this implies the dBASE
software is available at the site and that someone there has some knowledge of
dBASE.

5.   The system menus and screens

The individual screens which appear on the microcomputer monitor can be categorized into four different types. They are as follows:

5.1   **Menu screens**   – These represent the various options available to the user.

5.2   **Data entry**   – These screens follow the outline of the subcontracting questionnaire and generally guide the user in the task of entering or recording data into the system.

5.3   **Specific help**   – In some cases (e.g., nomenclatures) help is available by pressing the F1 key.

5.4   **General help**   – Where no specific help information is available, this screen appears. At present only a few screens make use of this facility. The user, with the help of someone who knows how to use both a microcomputer and an editing software, could insert text into these screens. The files are named GHS**.TXT – where ** reflects the screen number. These screens were intentionally left blank in order to allow users to tailor them to their specific needs. As users become more familiar with the system, the information could be changed to reflect different needs or instructions.

Appendix A contains a printout of all the system screens just as they would appear on the computer monitor. They are nothing more than a screen dump to printer of the UNISS system. It should be noted, however, that even though all the screens are attached, only those which were felt to require further clarification contain additional descriptive text instructions (printed in italics). Most are very straightforward, and as much as possible, whatever extra help was considered necessary has been incorporated in the screen in question through the specific help (F1) key.

6.   Special function keys

Key	Functional use
Esc	When in a Help screen and the user wishes to <u>return</u> to the calling screen without altering the contents of that screen. In general, if in trouble, try depressing this key.
F1	This is the <u>Help</u> key. Depending on where the cursor is on the screen, depressing this key will return either a general help screen or a specific one.
F2	The <u>Index</u> key, when depressed, will bring up the table of contents which reflects the individual sections of the questionnaire. Should the user wish to go to a specific system screen, the cursor should be positioned at the desired descriptive text and the Enter key pressed.
F3	This key has no programmed function at this time.
F4	The <u>Delete</u> key will, when depressed, erase either a whole line of data or just the single field. What will be deleted will be determined by the cursor's position on the screen. Whenever this function is used, the user is asked to confirm his choice.
F5	This is the <u>Modify</u> function key. When working with the various subcontracting nomenclatures, the user must first press this key in order to modify the descriptive text which accompanies the numeric code. The text to be modified will then be highlighted, and desired changes or insertions can be made.

F6   When within a Help screen, this key allows the user to <u>Sort</u> the nomenclature displayed. Sorting can be on either the numeric code (first three digits) or the character description (also first three characters).

F7   The <u>Restart</u> function allows the user to begin a new series of questions when in search mode.

F8   The <u>Browse</u> function key, when depressed, will display the Enterprise Code and acronym of those companies which have met the specified search conditions. This command is only available when a search has been invoked.

F9   The <u>Save</u> function tells UNISS that the user wishes to permanently record the data entered during this session.

F10   The user can, at any time, elect to <u>Quit</u> or stop whatever activity was being performed at the time and to return to the main menu screen. Note again that the user will always be asked to confirm this choice. This function does <u>not</u> perform a Save of any information either entered or modified. F9 should be used for this purpose.

Home   When this key is depressed, the cursor will reposition itself to the <u>first</u> screen entry. This applies to both data-entry and help screens.

End   The function of this key is exactly opposite to that of the Home key. The cursor will move to the <u>last</u> screen entry.

PgUp   This key serves a dual purpose. If the displayed screen is a data entry type, the depression of this key will display the <u>previous</u> system screen. If, however, the user is within a help screen where more than one page of information is available, the use of this key serves to bring back the <u>previous</u> help page.

PgDn   This key's function is similar to that of the PgUp key, but only in reverse. It will move the user to the <u>next</u> available screen.

Ins   Depressing this key allows the user to <u>insert</u> text within a data field. This key is normally used when one wishes to <u>correct</u> without retyping the entire displayed text (e.g., nomenclature description). To return to normal overwrite mode, this key should be again depressed.

Del   When depressed, this key will <u>delete</u> the single character where the cursor is positioned. This function is similar to the function performed by the F4 key, except that the Del is character specific, whereas F4 is field specific.

+/-   These two keys, used individually, allow the user to <u>skip</u> through screens which are identical in layout but different in contents.

Enter The Enter key is used to <u>confirm</u> the user's choice.

Alt P When in the Nomenclatures' menu, the user wishing to have a hard copy or <u>printout</u> of a specific nomenclature file can do so by pressing the Alt key and the character P at the same time. The printer should be switched on and <u>on line</u>, otherwise UNISS returns an error message.

     The user should always refer to the last two lines on the screen with which he is working, as these lines will normally reflect which special function keys are active for the screen in question. If the key is not shown, then it is not active. It may happen that the displayed command lines contain some key functions which are not active; however, depressing them will have no effect on the screen.

7.   General comments

     It should be pointed out that this brief description of UNISS should not be taken as a replacement for the users' guide, supplied by the subcontracting expert, on how to fill in the subcontracting questionnaire. It is actually assumed that

UNISS users are familiar with running SCXs. It was not meant to be run by junior clerks or secretaries, but rather by technically competent personnel. This software must be considered just another <u>tool</u> in helping to run the exchange. UNISS is not an intelligent system, and therefore all questions asked must be, technically speaking, properly formulated. The inherent dangers of allowing unskilled users to operate UNISS are firstly, that data will be mechanically entered into the system without benefit of last minute correction. Secondly, improper formulation or understanding of technical terminology will lead to erroneous formulation of questions and, therefore, answers. The consequences of this last point will lead entrepreneurs to avoid the SCX and to seek help elsewhere. The information supplied is only as good as the data input into the system, and the quality of service is very much dependant upon the skills of the system operators.

The information gathered by the SCX can also be put to other valuable use. The type of data collected is more bibliographic in nature rather than statistical. Nevertheless, the data can be transformed, through user written software, into a valuable national statistical database which can supplement or allow for the cross-checking of other available sources of information. This point should <u>not</u> be overlooked by SCX managers.

ANNEX II

NETWORKING

General comments

The technology for setting up electronic networking or telecommunication systems exists and is, generally speaking, easy to implement. One of the primary reasons for establishing a networking system is that users or groups of users have clearly identified a need for accessing and exchanging information from various parts of their geographical region or from the world as a whole. Furthermore, this need for information has also been identified as being of such a nature that immediate access to available sources is necessary. Conventional sources, such as normal mail services, will not suffice. To be hooked up to established networks is one thing, but to make available one's own data to others is another. This last point should be considered very carefully before going on-line in an electronic networking system. Keeping up with the state of the art with respect to computer utilization and the facilities offered by these should not influence the user in his decision to over-automate his working environment. The wrong reasons for electronic networking and its potential misuse could be costly, not only with respect to reputation, but also financially.

More specifically, subcontracting exchanges (SCX) in the Arab Region should be able to access databanks of not only established exchanges, but also other available sources of information which will help in running an efficient SCX. However, before they themselves make available their own national or regional data for public consumption, they must be sure of its quality. This implies that the SCX data files contain accurate and up-to-date information which would be of interest and use to others both regionally and internationally. In order to accumulate a reasonable amount of enterprise information, which would then be justification for entering into an electronic networking environment, a certain period of time has to pass. Each individual SCX will have to establish its own schedule for connecting to a network. The timing of this action will very much depend on how fast they gather the necessary enterprise information. Furthermore, before national borders are crossed, one should ensure that a sound National policy and standards for establishing networking systems exists and if these do exist, they should be strictly adhered to.

Even though the establishment of a Regional Arab Network was one of the objectives of UNIDO-executed project DP/RAB/86/001, it was not seen as one of its primary goals. This is clearly a secondary outcome of this specific project. The primary goal is the establishment of the National SCX which will initially serve a restricted group of local entrepreneurs.

Another point worth mentioning here is that most of the existing exchanges (e.g., Barcelona Chamber of Commerce, Bourse de Sous-traitance de l'Est, etc.) are not hooked up electronically to any other exchanges. As a matter of fact, the Barcelona one is not even computerized. In the case of the Barcelona exchange, they have over two thousand (2 000) subscribers, and on average handle approximately five (5) cases a day. This fact is just mentioned to reinforce the idea that careful thought has to be given before making this type of data available for public consumption.

Networking options

There exist several means by which an SCX established under the Regional Arab Programme for the Development of Subcontracting could communicate either with each other or with other outside sources of information. Without going into an unnecessary amount of detail, the possibilities could be summarized as follows:

1. Electronic networking systems

This method requires several pieces of hardware and some communication software which are readily available in most countries either through local PTTs or commercial outlets. Furthermore, it is strongly recommended that interested parties contact their local PTT office in order to ensure that whatever method or equipment they use is compatible with the country's installed telecommunication system. To deviate from national established standards is both foolish and contradictory. It will only cause unnecessary problems which will obviously lead to malfunctions. The basic pieces of equipment one would need for establishing an Arab Regional or international networking system can be summarized as follows:

(a) First and foremost, access to a reliable telephone line is essential. Reliable here implies a line which will not be affected by external electrical or electronic 'noise' or disturbances.

(b) Obvious, but needs to be mentioned, the local PTT must be connected to the international telephone system (preferably by satellite, e.g., ARABSAT, TRANSPAC) and be able to handle communications hardware such as modems (modulators/demodulators).

(c) A modem operating at 300/1200 Baud rate, asynchronous, is a basic requirement, or one operating at 2400/4800 Baud synchronous. Faster transmission rates are also possible, but again, this very much depends upon the local PTT's switching devices and the type of host computer being utilized (PCs or mainframes) by the end user.

(d) A computer, either mainframe, mini or micro, with networking facilities, together with the necessary communication software.

2. Facsimile and Telex

Even though the following does not, purely speaking, fall into the category of a networking system, it is worth reminding the reader that they exist and could have a role to play in communicating information. The Facsimile (FAX) machine, already well-established in most parts of the world, offers a reliable, quick and relatively inexpensive means of communication. The FAX is becoming more and more popular, so much so that industrialists use it extensively for their day-to-day communication needs. The FAX machine should definitely be considered as a good alternative to electronic networking, at least until a more elaborate and sophisticated system becomes necessary.

Another non-networking option is the well-established TELEX system. Considering the type of information being handled by an SCX, this method should also be considered as a reasonable method of exchanging information, especially if the FAX is not available. The TELEX machine has been around for many years, but it is still widely used. It may be old technology, but it works.

At present, UNIDO's "Industrial and Technological Information Section" is investigating several options for establishing an electronic mail (E-Mail) service through its "Industrial and Technological Information Bank" (INTIB). This service, when fully operational, will allow users to access both UNIDO's internal databases, as well as other external ones. Subscribers, or nodes, as they are referred to, would also be able to communicate with each other. It is worth mentioning here that INTIB disseminates information and assistance to approximately 54 focal points in 46 member countries.

3. Magnetic media device

This method entails copying the collected enterprise information onto some form of magnetic media device, such as streamer-tape or floppy disk, and distributing them to interested parties. Even though this method does not necessarily

take advantage of the latest electronic technology available on today's market, it is one which has been fully tested and found to be extremel; reliable and satisfactory.

Given the not-too-dynamic nature of subcontracting information, there appears to be no pressing need to have on-line telecommunication hook-up with other exchanges. An exchange of diskettes, for example, on a quarterly or bi-yearly basis, would probably suffice to keep other exchanges informed about the current status in the various countries. This method is not only reliable, but also very inexpensive to implement and maintain.

The other advantage of this method of 'communication' is that the countries are free to exclude whatever information they would wish to keep private from other users.

Recommendations

1.   The basic communication needs of an SCX would be better served by using the magnetic media device method, at least for an initial period of say two to three years. It is, for the presen:, all that is, realistically-speaking, needed. Users who have other reasons for envisaging electronic networking should justify their own needs. The initial National needs of an SCX are fully met by this proposed method. Once the need for more sophisticated methods is warranted, electronic networking facilities, possibly using UNIDO's INTIB system, can then be looked into and hook-ups quickly established.

2.   Should the above recommendation be accepted and put into practice, UNIDO headquarters will require a microcomputer for copying and disseminating the SCX data, for further training and demonstration purposes, testing of various telecommunication software, and also for potential modifications and corrections to the UNISS software.