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Data Processing "Informatique" for Industrial Development in TUNISIA

Report of the Mission of the United Nations Industrial Development Organization (UNIDO) to TUNISIA) - 12 March 19

I. PREFACE

This report has been prepared by Dr. Mostafa A. Hamdy of the Industrial Policies and Programming Division of the United Nations Industrial Development Organization (UNIDO) who undertook the above mentioned mission.

Mr. Hamdy acknowledges with great indebtedness the discussions he undertook with, and the assistance and hospitality extended to him by, Messrs. M. Zaanouni, the Director General of the National Centre for Industrial Studies (CNEI) Tunis, Mr. A. Daya, the Deputy Director of the CNEI and Mr. H. Tchroll the Project Manager of CNEI, who made it possible for the mission to be completed in the short period which was available for it.

Acknowledgements are also due to all the Tunisian officials whom Mr. Hamdy interviewed, in particular: Dr. A. Khamakhem, Director General of the National Institute for Productivity, Mr. Abdel Wahab Ben Hamadi, Chief of Section for General Studies, Direction of Industry, Ministry of Economic Affairs, Mr. Kilani Salem of IPM France and Mr. Mustapha Boulom of the CNEI.

II. OBJECTIVE OF THE MISSION

The main objective of the mission was to identify the problems encountered in Tunisia regarding data processing for the industrialization process and to put forward pertinent recommendations to this effect.

III. INTRODUCTION AND BACKGROUND ON DATA PROCESSING

It became necessary to consider the upheaval which is taking place in development activities from planning, through implementation, to operation and control as an "information revolution" in which people from different disciplines using various techniques and procedures are engaged.

The development process, for a considerable part, involves the collection of data, processing of this data, i.e. carrying out computations on it according to some models or techniques, transferring the resultant information to its users, storing information and retrieving information whenever needed. This is evident in each stage of the development process: in preparing plans or programmes of development, in implementing these programmes and their constituent projects, and in operating and controlling projects or plants.

In order to cope with the ever-increasing demand for information, it was inevitable that attention should be given to more accurate, reliable and faster handling and transfer of information. In this regard a number of techniques and systems have been developed.

Manual computing systems were the first to be developed. The primary drawback was the inability to perform more than one function at a time. Equipment was then developed which was capable of performing computing and recording, such as the desk calculators or the cash registers. The latter, for example, provides computing and recording, issues receipts to customers and gives helpful management information. Errors in computation due to the human element involved coupled with slowness of operation were unavoidable.

Even after developing the machines combining computing, sorting, distributing and recording, these functions were not really integrated. A human operator had to transcribe from the documents generated during each data processing step and to transport the punched cards from one machine, after performing one or more functions, to another machine to perform other functions. The punched card equipment (tabulating machines) were then developed in order to ensure more compatibility among machines of the same brand. Punched card systems, however, could not obtain the degree of accuracy nor speedy operation required. This was attributable to the necessity of the operator having to move the punched cards from one machine to another in a sequence of operations and having to initiate each processing step as well. Added to this was the slowness of operations due to the fact that the machines used mechanical and electro-mechanical parts for performing their functions.

The mechanical and electro-mechanical parts mentioned above were then replaced by electronic parts and thus electronic computers and the electronic data processing

(EDP) systems were developed to provide automatic control[1] and stored-programme processing.

The development of the electronic computer, with its capability of carrying out the information handling and transfer process accurately, reliably and millions of times faster than the speed of a human being, must have a great impact on the work involved in economic and industrial development as well as on the structure or set up within which this work is undertaken. This is [illegible] the following main consequences:

1) Recipients of information, as for instance directors or division heads in an organization, can get only the information they need and no more. The computer can print this part of the information in the way or form required and ensure that up-to-date information is always transmitted in real time[2] to the recipient of information. Add to this the possibility of rapid simulation of alternatives of action for optimization which will urge decision-makers or management to:

   (a) determine at the outset the information they really require to discharge their functions and hence no time and effort is wasted in collecting and reviewing unnecessary information;

   (b) benefit from the computer speed in transmitting information to them through becoming more capable of making decisions and taking action considerably faster.

2) In an organization, the impact of the computer on the information system or information flows is profound. Since the design of an organization structure

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1/ Automatic control means that the instructions to be given to the computer, which are in the form of an operating or control programme, are stored together with the data to be processed in the memory (the storage) of the computer. Accordingly, a "stored programme computer" denotes a computer which is controlled by a list of instructions stored in its memory or storage area to which it refers in a specified sequence when the application programmes (the programmes put on the computers for processing and solving, such as programmes related to investment planning, resource allocation, inventory control and payroll problems) are being executed.

2/ "Real-time" implies that information concerning some situation is transmitted fast enough to the information user so that he can make a decision or take action in time.

is the design of an information system, the computer assists in establishing what has become to be called integrated management information systems, which implies that in an organization hierarchy each organizational unit is interrelated to other units at the same or other hierarchical levels and accordingly the management structure is likely to change.

Although actual application of computers started only 14 years ago, great strides have been taken in computer technology during this rather short period. Three computer generations have been successively developed and used for commercial as well as scientific or technical application. Each computer generation is characterized by certain improvements in computer design, size, capacity, speed of processing and operating costs over computers of the preceding generation. While the 4th computer generation[1/] is expected to be on the market early in 1971, some computers have been developed as a transition between the 3rd and 4th generations.

It is interesting to mention that the cost of computers, in terms of storage cost: $\frac{\text{computer price (purchase)}}{\text{storage capacity}}$ has been reduced by at least 80% within the last 10 years, while the cost of the software has been steadily increasing and this will be the prevailing trend. The latter is attributable to various factors such as the excessive varieties of reporting systems and the development of the capability of the hardware through the development of programmes for time-sharing (time slicing),

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1/ Electronic data processing systems (computers) consist of hardware, i.e. the equipment (central processing unit, auxiliary memory or storage, and input-output units) and software, i.e. the programmes. The 4th computer generation is expected to bring about a number of improvements in both the hardware and the software. For the hardware it would probably be based on large-scale integrated circuits. Since the central processing unit of a computer is now capable of performing computations at a very high speed, further development of computation speed would be of insignificant value. In addition, improvements in auxiliary capacity, magnetic tapes and discs would be made. As regards software it is expected that this would include improvements in programmes, better price/performance ratio and last but not least greater improvements in man-computer systems where a tight interactive relationship between the user and the computer would be achieved. Man-computer systems make it possible for the user to communicate with the computer in the human language rather than in computer language. The latter involves a process of translation from the first.

on-line processing and the like 1/

The above mentioned development in computer technology has contributed to the increase in the number of computers installed as well as ... the order from about 1,000 in the entire world [illegible] to about [illegible],000 today, of which about [illegible]-8% are in developing countries. Moreover, the number of computer applications has considerably increased. In the highly industrialized countries the ratio of commercial (payroll, invoicing, billing, etc.) to scientific (marketing, distribution, production, engineering programmes, planning and control including modelling at macro and micro levels) computer applications could be estimated on an average at 70:30. The latter, i.e. planning and control including modelling, investment analysis and operation research amounts only to a very small percentage of computer applications which might be in the order of 5-[illegible]. This percentage may be even less in developing countries. However, there is enough indication for a remarkable growth in computer applications in this area in the years to come. This is true as (a) planning and control are now widely accepted as a prerequisite discipline for the industrialization process, and (b) there is an increasing demand for establishing computer-based government and management planning and control information systems.

IV. APPROACH FOLLOWED BY THE MISSION

In a mission of this type the collection of data on the various relevant problems faced is of essential importance.

Data processing activities are closely related to the various functions of industrial development in a country at both the aggregate as well as the micro levels.

1/ Time-sharing allows many users to share a computer at the same time, in such a way that each user seems to have the computer's exclusive attention. This is important since the central processing unit, which performs the arithmetic operations, has a considerably higher speed than the input-output units. The central processing unit would therefore be idle during a good part of the time needed to execute a single programme. Thus time-sharing aims at keeping the central processing unit as occupied as possible.

On-line processing provides the possibility of entering or retrieving data into or from an electronic data processing system respectively from a remote location through a communication terminal similar to an office typewriter or telephone line.

In other words problems of data processing should be considered in the light of the various industrial development functions such as planning, implementation and management as well as techniques used in performing these function and the organizational structure within which these functions are being undertaken.

Section 4 below mainly deals with these major functions and techniques in Tunisia and their data processing requirements during the present time and in the future. Some pertinent recommendations and a programme for the development of electronic data processing for the industrialization processes in Tunisia are then put forward. To this end a considerable number of Tunisian officials at the various levels of the organizational hierarchy for industrial development have been interviewed, most of the computer centres in Tunis have been visited and their management have also been interviewed. Also two surveys have been proposed which are included in Annexes I and II of this paper. The first is a "Questionnaire on Computers and Their Utilization in Tunisia" and the second is "A Guide to Assessing An Information System". The first survey has been successfully completed whereas the second could not be undertaken for reasons beyond the control of both the National Institute for Industrial Studies and the mission.

V. THE FINDINGS AND RECOMMENDATIONS OF THE MISSION

1. Machinery for Industrial Development

The organizational hierarchy for industrial development in Tunisia has been subject to some changes; the most recent one being in October 1969. It is a known fact that administrative reforms take time to settle down and this is a major problem facing Tunisia at the moment.

The issue here is that an adequate planning, implementation and control information system with well defined channels of communication and reporting is essential for an effective industrialization process. Since the determination of an organizational structure in a certain hierarchy implies the determination of the information system with its information flows within it, any administrative reforms in the industrial sector will definitely have an important impact on the industrial information system previously mentioned. Therefore any delay in settling down these reforms will delay the establishment and efficient running of the information system and consequently will impede the industrialisatio

process. Hence the country is urged to take some measures to expedite the putting of these administrative reforms into normal operation.

The organization structure of the machinery for industrial development has been studied during the mission. Since it was of essential importance to obtain detailed information a survey was designed (see Annex II) to relate the organization structure with the information system for each component of the machinery for industrial development, in order to detect the present problems and shortcomings and to recommend some corrective measures. Since such information needed some time to be collected and as Mr. Mandy's mission was short the survey has been left to the CNCI to complete. However, due to some factors beyond the control of the CNCI the survey could not be carried out, as mentioned above, although it would have supplemented the interviews undertaken in this respect.

What could be mentioned here is that it is of prime importance for the country to get some assistance in this regard. It is therefore proposed that the country request from UNIDO an expert for six months to be financed through the Special Industrial Services (SIS) funds to:

(a) look into the organizational hierarchy of the industrial sector with its various hierarchical levels ranging from the "Secretariat d'Etat au Plan" at the top to the management of individual industrial establishments down the line, and recommend some modifications or improvements if necessary;

(b) work out in detail the interrelationships between the various components or bodies in the organizational hierarchy;

(c) establish the necessary information flows and reporting systems within the hierarchy for industrialization;

(d) recommend any further assistance to be requested by the Government in the future.

2. National and Sectoral Planning

This function is being undertaken by the Secretariat of the Plan - "Secretariat d'Etat au Plan." The current Development Plan covers the period 1969 - 1972. To some extent a linear programming investment model was attempted in 1968 to test some of the assumptions on which the Plan was based.

The model was Léontief - Bratislava Model. The economy was aggregated into three sectors: agriculture, industry and service and computations were made in the Bratislava Computing Centre, Czechoslovakia. In fact, no formal mathematical techniques were used in preparing this Plan and it is no more than a mere listing of a number of projects which were deemed to be important to the country at the time the Plan was prepared. It should be stressed that the model was not used to prepare the Plan, on the contrary the Plan was used to build the model.

For the next Development Plan of 1976-1980 we have been told that more formal planning techniques would be used. An input-output table of 80 x 80 and a linear programming model would be attempted, (because of lack of sufficient data the input-output table would probably be of a smaller size than 80 x 80). The model will be also used for operational plans (yearly plans). Application of mathematical model building for planning definitely necessitates the utilization of computers and this is for the following reasons:

(a) As a useful tool in economic and industrial planning mathematical models should have some degree of detail and hence become more complicated for development and application. The level of detail (i.e. the number of sectors included) of a mathematical model depends on the data available and the data processing system used. Inadequacy in any of these factors will inevitably impose substantial modifications on the model which frequently makes it of questionable value. This is true since the application of mathematical models in development planning involves not only theories to describe the relationship between the economic variables but also excessive data retrieval, rapid and reliable data processing and a large number of trials during the various stages of model building and application.

(b) The decision of the Secretariat of the Plan to use input-output analysis in the preparation of the next Four Year Development Plan requires some attention. It has been understood that the input-output table envisaged to be prepared would be mainly used for structural analysis of the economic system in Tunisia and presumably

[illegible]

[illegible]

During the [illegible] table and the linear [illegible] every two years [illegible] utilization [illegible] systems to monitor these [illegible] in order to detect in time any changes in the [illegible] communicate the necessary information [illegible] planning system at the correct time [illegible] and reliably using the new input [illegible] whether [illegible] of these models will be significantly affected [illegible] changes to warrant its modification; and, if so, to update [illegible]. In this connection it is needless to over-emphasize the importance [illegible] information systems.

Another point that should be mentioned is that any plan of development should be based on studies in the various sectors of the economy. As regards the industrial sector, the country should undertake studies to determine its present status, problems encountered

and to provide the required projections. The CNEI can be very instrumental in this respect. We were pleased to notice that the CNEI has been performing the activities which are mainly centered around feasibility studies mostly agricultural and industrial. In order to further these activities the work of the CNEI needs to be publicised more so that various industrialists and entrepreneurs can know more about the centre and the services it can provide.

A general observation that we have learned that not much of the work necessary for the preparation of the next Development Plan, 1972-1975, has been done. In view of this and aforementioned shortcomings and the lack of necessary studies and information, the following points should be borne in mind:-

i. The preparation of a Plan should end a few months before the beginning of the Plan period, so that executing and operating agencies may become acquainted with the projects/individual shares and be ready for their implementation.

ii. Bearing in mind the various technical, economical, administrative and managerial difficulties in the country and that the next Plan is supposed to be put into effect by the beginning of 1972, the preparation of an implementable comprehensive Four-Year Plan might not be feasible. The alternative might be to start immediately on the preparation of a shorter-period Plan, say for two years to begin in 1972, and carry out longer-period sectoral programming of say four years. So, the latter may provide the perspective needed which a comprehensive Plan of two-years might lack in comparison to a four-year Plan. This has two advantages. One is to achieve more reliable Plan estimates and the second is to shorten the time and reduce the effort needed to formulate the Plan and devote extra time to the preparation of more reliable sectoral programmes and a number of well-conceived projects. Otherwise the Plan might run the risk of collecting a few available projects which will be far from viable for its implementation. During the horizon of the Plan it is of importance that it should be updated together with the sectoral programmes. This may be achieved through the preparation of annual plans and the establishment, as previously mentioned, of a better planning, implementation and monitoring system.

As information and programming lat become more available and as more Tunisian Nationals become more acquainted with, and acquire experience in, modern planning techniques, longer-period plans can then be prepared.

5. Project implementation

We have been told that the application of more effective techniques such as network techniques, has started in programming and scheduling a small number of projects. It should be borne in mind that the difficulty in project implementation is not so much the process of programming and scheduling at the outset, but it is in fact, how to exercise effective project control[1] during the various phases of project implementation based on effective feed-back or reporting. Project control is a difficult task in the environment of the developing country and this is attributable to a number of factors. An important one is that

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1 In implementing a project it is not practical nor possible to attempt to work with the entire project as a single entity. t should be therefore sub-divided into its component activities or operations such as project detailed design and engineering, bidding and contracting, construction of plant, erection of machinery and equipment, and start-up of production as well as the de-bugging of the managerial and production processes. Programming of project implementation is thus used to indicate the process by which the component activities of a project are put in their rightful chronological order and their interrelationships are identified. The latter is of essential importance since in implementing a project some activities have to precede others, some have to follow others and some have to be undertaken at the same time with others. According to the methods that are to be used to undertake each activity and the resources allocated to it, an estimate of the time duration required for the carrying out of each activity is to be made in order to arrive at the time schedules for each activity as well as that of the project as a whole. The result of programming and scheduling is a time-phased plan for implementing the project, making into account available capital, manpower and material resources. The plan in this form is a very useful management tool as it detects the order of magnitude of potential bottlenecks that would hamper project implementation and determines the periods during which they would occur. Consequently management would be in a better position to take corrective action ahead of time and direct its efforts and resources where they fit best.

Control of implementation involves; the coordination of the work of all parties (the enterprise, contractors, government departments, ... etc.) participating in implementing the project, the feed-back of actual performance to be compared with estimates of the implementation plan and the taking of necessary corrective measures.

most development projects need a relatively elaborate organization of the work to be done. Furthermore, conditions can drastically change in the course of implementation in developing countries which require frequent collection of data and information, periodic evaluation of progress, which may be weekly or bi-monthly, and revision of the strategy previously adopted. In this regard computers can be used to great advantage as they are capable, through sorting and selective printing of information, of processing considerable amounts of data and arranging the results in a great variety of ways to meet the needs of each of the recipients of information.

The limited application of network techniques in project implementation at the present time in Tunisia should be looked at as the prior stage of using computer-oriented network techniques which should be anticipated soon. Since project implementation is the phase where major problems impeding the industrialization process take place, we strongly recommend to the Government that effort should be spent in furthering the application of the network techniques in all types of projects and consideration would be soon made for the application of computer-based techniques for the implementation of medium and large size projects. To this end the country should be provided with assistance. It was proposed during the mission that the country would request from UNIDO a three-expert Advisory Mission on Industrial Project Implementation for three weeks to be financed by Special Industrial Services (SIS) funds. The mission would:-

(a) review the process of industrial implementation in the country with a view to identifying the major shortcomings hampering project implementation;

(b) introduce and further the application of network techniques and related systems in implementing projects;

(c) assist in programming and scheduling the implementation of one or two actual projects that would be soon executed;

(d) assist in acquainting Tunisian officials with these techniques through "learning by doing".

(e) recommend any additional assistance to be furtner requested by the Government.

It is worth mentioning that the official Government request for this Advisory Mission has been received by UNIDO. The mission would be sent to Tunisia as scheduled in the request.

4. Enterprise Management

Existing industries are encountering a multitude of problems. From the interviews it was learned that no formal management techniques are used in the decision-making process related to various management functions. It seems appropriate to discuss briefly what we mean by management functions.

Basically, management has two main groups of functions; planning of future operations and control of operations.

Planning or strategic planning[1/] involves the determination of organization goals, any necessary changes in them, allocation of resources to these goals and definition of policies for acquiring and using the resources. Strategic Planning decisions are those one-of-a-kind decisions which commit capital resources, such as those related to whether a new plant should be built, which of several available technologies should be adopted, how the distribution of a product can be improved to provide faster service to customers, etc.

Control functions are of two main types; management control and operational control. Management control involves the establishment of procedures to assure the effective utilization of the resources to accomplish the goals according to the policies set up by strategic planning. For example, formulation of budgets requires management control decisions and although a good part of management control is planning, yet it differs from the strategic planning mentioned above. Operational control comprises the day-to-day decisions that are necessary to carry out the projects or enterprise operations according to the objectives and resources prescribed by both strategic planning and management control. For example, production scheduling and control and inventory control require operational control decisions: for illustration, day-to-day decisions on how to handle special jobs, what to do in case of material shortage, how to schedule material and manpower, how to complete a rush job at the promised time, etc, are to be taken.

1/ Robert N. Anthony, "Planning and Control Systems; A Framework for Analysis", Boston, Harvard University, Graduate School of Business Administration, 1965.

As in national or sectoral planning and project implementation, decision-making related to enterprise management needs both decision-making techniques and information. The latter, however, is a function of the former since information requirements vary from one decision-making technique to the other. The interviews have shown that since no formal techniques are applied, as previously mentioned, in discharging the various functions of management, areas such as cost-effectiveness analysis, resource allocation, inventory control, production control are either overlooked or inadequately dealt with and hence many of the existing Tunisian industries have fallen short of expectations.

We were pleased to note that the Tunisian National Institute for Productivity has recently started taking steps in assisting Tunisian industries in this important area of activity. In this respect the Institute should be provided with assistance. As of now the assistance could be in the form of an expert on management and operations research techniques for six months, who would study the problems of existing enterprises and develop ways and means of introducing these techniques for more effective enterprise management. When these techniques are applied they would generate certain needs which computers and related systems would be required to satisfy ..

In reviewing and introducing more effective techniques for any industrial function, be they for planning, implementation or management, two points should be observed:-

(a) the techniques should be adapted to conditions prevailing in the country (such as those related to scarcity of skilled personnel and lack of necessary information);

(b) the techniques should upgrade the various kinds of information required so that gradually better or more sophisticated techniques could be used.

5. Data Processing "Informatique"

In Tunisia there are about 26 tabulating machines and 10 computers. The computers available are listed in the following table[1] :-

Number of Computers	Brand	Type	Capacity of the memory of the control unit
1	IBM	360/30	64K[2]
1	IBM	360/20	16K
1	IBM	1401	16K
1	IBM	1401	12K
2	IBM	1401	8K
1	IBM	1401	4K
3	NCR	500	4800 characters

Two of the existing IBM 1401 will be soon replaced by two IBM 360/30. This will increase the number of the series IBM 360 to four systems which will be available to the Department of Statistics, the Tunisian National Bank, the Ministry of Post, Telegram and Telephone and the Department of Electricity and Gas.

In this regard the survey and interviews undertaken during the mission have revealed the following:

1/ This table has been derived from table 5,1 of "L'INFORMATIQUE EN TUNISIE, 1969", prepared by the Institut National de Productivite et de Gestion des Entreprises, Tunis.

2/ "K" denotes 1024 bytes. One alphabetic or numeric character can be stored in one byte.

(a) The computer systems available are solely used for data processing which is related to some administrative activities such as payroll, accounting and the like. This is evident from the survey undertaken which revealed that eight out of ten computers are mainly for commercial processing.

(b) It was learned that the existing IBM 360/30 is only used in commercial processing. Even the two IBM 360/30s which will be installed soon are envisaged to only deal with the processing functions which their two IBM 1401 predecessors have carried out. Furthermore, if we know that the IBM 1401s in the computing centres visited are being used, on the average for seven hours a day, we would expect that the same work would soon be undertaken by the IBM 360/30s in about three hours which leaves the computer idle for about 21 hours a day if there are no additional processing functions that would be developed and put on the computer.

(c) Despite its relatively small core memory which is 64K the IBM 360/30 could be used for both scientific (or technical) and commercial applications. Nevertheless, no agency which has or will acquire such a computer has prepared or is preparing programmes for utilising this computer in scientific or technical processing. This might be attributable to a number of factors. Foremost are:-

(i) lack of local personnel who are conversant with formal effective techniques for industrial planning, implementation and management which, for a great part, requires the utilization of computers;

(ii) lack of data and information required by these techniques;

(iii) lack of orientation of Government officials encharged with the various industrial development functions of what a computer can do and when computer utilization is necessary;

(iv) lack of appreciation, on the part of the officials, of the fact that some time and effort is needed to retrain and upgrade computer programmers and operators who worked

on IBM 1401 before they could be transferred to the series IBM/360. The latter, moreover, needs system analysts and engineers who are in extreme scarcity in the country and whose training requires special attention.

VI. Measures to Implement the Recommendations

1. Beside the two experts proposed above, one for the improvement of the machinery for industrial planning, implementation and operation and the other for introducing quantitative techniques at the micro level, the two experts should have some coordination in their work.

2. Their reports, in addition to the report on the Advisory Mission on Industrial Project Implementation previously proposed, should be discussed together. It is recommended that a committee be formed to discuss these reports and UNIDO would participate in the discussions if the Tunisian authorities feel it is necessary. The committee would comprise a representative from each of the following agencies: the Secretariat of the Plan, the Ministry of Economic Affairs, the National Centre for Industrial Studies, the National Institute for Productivity and some representative from the private industrial sector. Each agency will select its representative. As regards the private industry sector, the Federation of Industry (UTICA) could designate its representative.

3. The committee would be authorized to ratify the reports making any necessary modifications regarding the recommendations and would then draw from them an appropriate course of action.

4. The committee would discuss these recommendations with the various agencies working in industrial development in the country and assist them in implementing them. In doing so, the committee would be assisted by a small number of technicians in this field who would work as a technical secretariat to the committee. If it is found necessary, assistance could be requested from UNIDO to support the work of the technical secretariat.

5. As this process goes on the need for computer application would increase since more new processing functions would be developed. During this interim period it is recommended that the computer system [illegible] of the Department of Statistics be used as a quasi-[illegible]. The [illegible] Secretariat, in such a case, would also work as an advisory body to the Department of Statistics to advise on running the scientific (technical) industrial problems on the computer.

6. Whenever the need for computer utilization has reached a level which warrants the utilization of a large scale computer, a larger computer such as the IBM 370/145 or IBM 360/50 or other equivalent brands would be studied to replace the IBM 360/30 of the Department of Statistics. The former have respectively twice and four times the memory storage capacity of the latter.

7. Whenever the need for data processing becomes excessive the establishment of a National Computing Centre, separate from the Department of Statistics, should be considered.

8. A Centre like this could be attached to some Government Department as for instance, the Secretariat of the Plan or the Ministry of Economic Affairs. The Director of the Centre would report to the head of either of these two bodies. The Centre could have a computer equivalent to the IBM 360/50 and would work as a coordinating body for data processing in the country as well as subcontracting some data processing work to other computing centres available in the country. It would be governed by a Board of Directors and would have an advisory committee of 12 - 14 members representing the various agencies using the computer for advising on: computer utilization, priorities, work programmes, training ... etc. according to the experience they would have acquired in this field. The members of the committee mentioned under items 2 and 4 of this Section and its technical secretariat would be considered in nominating members of the Board of Directors and the advisory committee of the proposed National Computing Centre. The Centre, in addition, would be staffed by a group of econometricians, operations research specialists, systems analysts, information systems specialists, management scientists and computer scientists. For the establishment and running of the Centre, UNIDO assistance if it is necessary, could be requested.

ANNEX I

(English)

QUESTIONNAIRE ON COMPUTERS AND COMPUTER UTILIZATION IN AFRICA

I. GENERAL

1. Name of the Organization:

2. Main activity(ies) of the Organization:
(For example if the organization is engaged in production, what is or are its main product(s) or the service(s) it renders)

3. Size of the organization:

Capital investment:

Labour:

Size of Production:

4. To whom the management of the organization reports:

II. SPECIFIC

5. Computer available (type):

6. Year of Installation:

7. Utilisation of the computer:

- Administrative utilization:

Accounting:

Payroll (wages and salaries):

Others:

- Technical utilization:

Planning of the activities of the organization:
(Such as marketing studies, production planning .. etc.)

Implementation of new projects of the organization:
(Such as the execution of new projects which might be expansion projects of the organization. Here the use might be in planning the setting up of the new plant and its construction and the start-up of production.)

Control of the activities of the organization:
(Follow-up of the activities, determining problems and bottlenecks encountered and taking corrective measures to alleviate these problems.)

Post-Audit of the activities of the organization:
(Evaluation of the operation of the organization and feed-back results to management for better planning of future projects and operations.)

Utilization by other organizations in the Country:
NOTE: Any formal models (for example mathematical models) which are used in any of the areas mentioned under "Technical Utilization" of computers should be stated and described.

8. Personnel available and engaged in the computer centre:

- Programmers:

- Operators:

- Others:

9. Problems encountered in using the computer:

- Lack of necessary data and information:

- Lack of qualified staff:

- Lack of adequate organization:

- Lack of adequate communication inside the organization:

- Number of hours the computer works per day:

10. Utilization of computers in the next five years:

- Future development of the computer:
(new computer would be installed)

- New areas of utilization:

- Utilization by other local organizations:

- Others:

ANNEXE

(Projet)

QUESTIONNAIRE SUR LA FORMATION

Sur les applications statistiques et leurs applications en matière

I GENERAL

1. Nom de l'organisation

2. Activités principales de l'organisation
(Par ex. si l'organisation est du caractère industriel, quels sont les produits ou les services les plus importants.)

3. Taille de l'organisation

Investissements

Emploi:

Volume de production:

4. Organisme de tutelle:
(ou organisme auquel l'organisation doit rendre compte de ses activités)

II. QUESTIONNAIRE SPECIFIQUE:

5. Calculateur (type):

6. Année de son installation:

7. Utilisation du calculateur:

Administration:

Comptabilité:

Salaires et traitements:

Autre:

[illegible]

[illegible]
par [illegible] planning [illegible]

[illegible]
[illegible] dans le domaine [illegible] être orientés [illegible] réparation [illegible] démarrage [illegible]

Contrôle courant des activités de l'organisation
Contrôle de l'exécution des activités, la détermination des impasses et goulots d'étranglement et la définition des mesures à prendre pour remédier à ces difficultés.

Contrôle additionnel des activités de l'organisation
Évaluation des opérations effectuées et des résultats de rétroaction (feedback) sur la direction (gestion); contrôle qui donne les impulsions à l'amélioration de la planification des projets et des opérations futures.

NOTE: Chaque modèle (formalisé) (par exemple le modèle mathématique) qui est utilisé dans un des domaines d'activité doit être mentionné et décrit.

8. **Personnel du Centre de l'ordinateur**

Programmeurs:

Opérateurs:

Autres:

ANNEX II

A GUIDE TO ASSESSING AN INFORMATION SYSTEM

This contains a number of questions to be answered by any individual at any level of the project environment in order to assess the effectiveness of the information system which supports him.

There are three sets of questions used. The first type, Table I, assesses the general management system from an information point of view. These questions deal with general managerial issues, but they allow assessment of management's communication system, which is a part of the information system. They can be answered "yes" or "no" because they deal with the existence or absence of some piece of information.

The questions are phrased so that a "no" answer is a sign of deficiency. A second set, Table 2, is designed to evaluate the general information system and requires an estimate of frequency of happenings according to the following scale:

1. almost always: occurs 90% of the time;
2. often: more than 50% of the time;
3. occasionally: about 30% of the time;
4. infrequently: less than 15% of the time;
5. never: less than 1% of the time.

A third set of questions, Table 3, deals with the adequacy of the reporting system in support of functions that the respondent must perform. These are rated according to the following characteristics:

1. excellent: never a bottleneck or detriment to performance of the function;
2. good: seldom a bottleneck or detriment to performance of the function;
3. fair: rather frequently a bottleneck or detriment to performance of the function;
4. poor: more often the impeding factor than any other single cause;
5. bad: more often the impeding factor than all other causes.

Respondents are allowed four additional answers which are not used in the analysis described subsequently. They are:

(a) Saturated: better or more than required, but good for general information.

(b) Superfluous: better or more than required and serves no purpose:

(c) Distracting: so much better or more than required that it acts as a detriment to actual performance:

(d) Upsetting: better or more than required and serves to disturb morale.

Table 1. Assessment of Management Communication

Please answer each question either "yes" or "no", but feel free to comment if a "yes" or "no" does not convey all the information you wish to transmit.

I. Do you know exactly how higher levels of management evaluate your work.

YES _____ NO _____

COMMENTS:

II. Do you have a clear written statement of your functions, responsibilities and authorities.

YES _____ NO _____

COMMENTS:

Table 2. General Assessment of Information System

1.	How often do you have trouble finding documents that crossed your desk previously?	/__/
2.	How much time do you spend in completing reports on progress?	/__/
3.	How much time in answering specific requests for information that exists within the organization?	/__/
4.	Do you find that you are often involved in crash programmes to meet deadlines	/__/
5.	What percentage of jobs are completed according to schedule?	/__/
6.	What percentage of jobs are completed within budget?	/__/
7.	How often do you find that you cannot schedule your work because higher levels of management are imposing ad hoc demands?	/__/
8.	How often do you generate requests to other organisation levels for information (excluding normal searches such as library searches, etc...)?	/__/
9.	How often do you find that there is more than one study on the same topic going on independently within the organization?	/__/

Table 3

ASSESSMENT OF THE REPORTING SYSTEM

There are several characteristics of a reporting system which define its usefulness. Please rate the information according to the following criteria for each function you perform. List your own functions in the left most column. Rank according to the following scale (definitions of terms are given in the instructions).

1. EXCELLENT 2. GOOD 3. FAIR 4. POOR 5. BAD A. Saturated B. Superfluous C. Distracting D. Upsetting.

Write the appropriate number or letter in the box below:

FUNCTIONS List all your functions which require information.	QUANTITY		TIMELINESS		CONTENT		AVAILABILITY Ease of obtaining.	QUALITY Freedom from errors.
	BREADTH Coverage of aspects required.	DEPTH Level of detail.	INTERVAL Time between reports.	LAG Time between collection and reports.	TECHNICAL LEVEL Relative to the individual's professional training.	PRESENTATION Clarity, Conciseness, ease of comprehension.		
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
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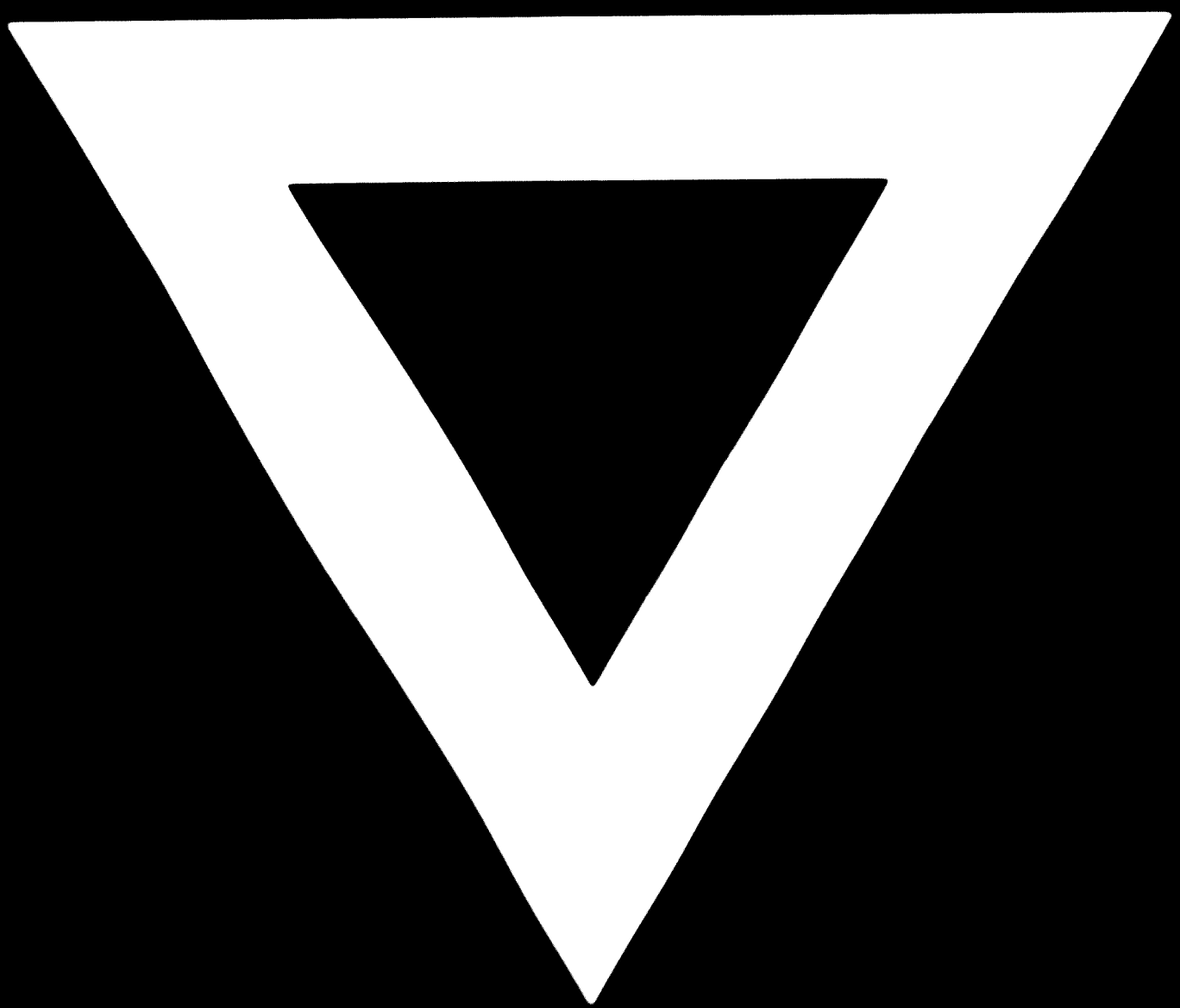

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