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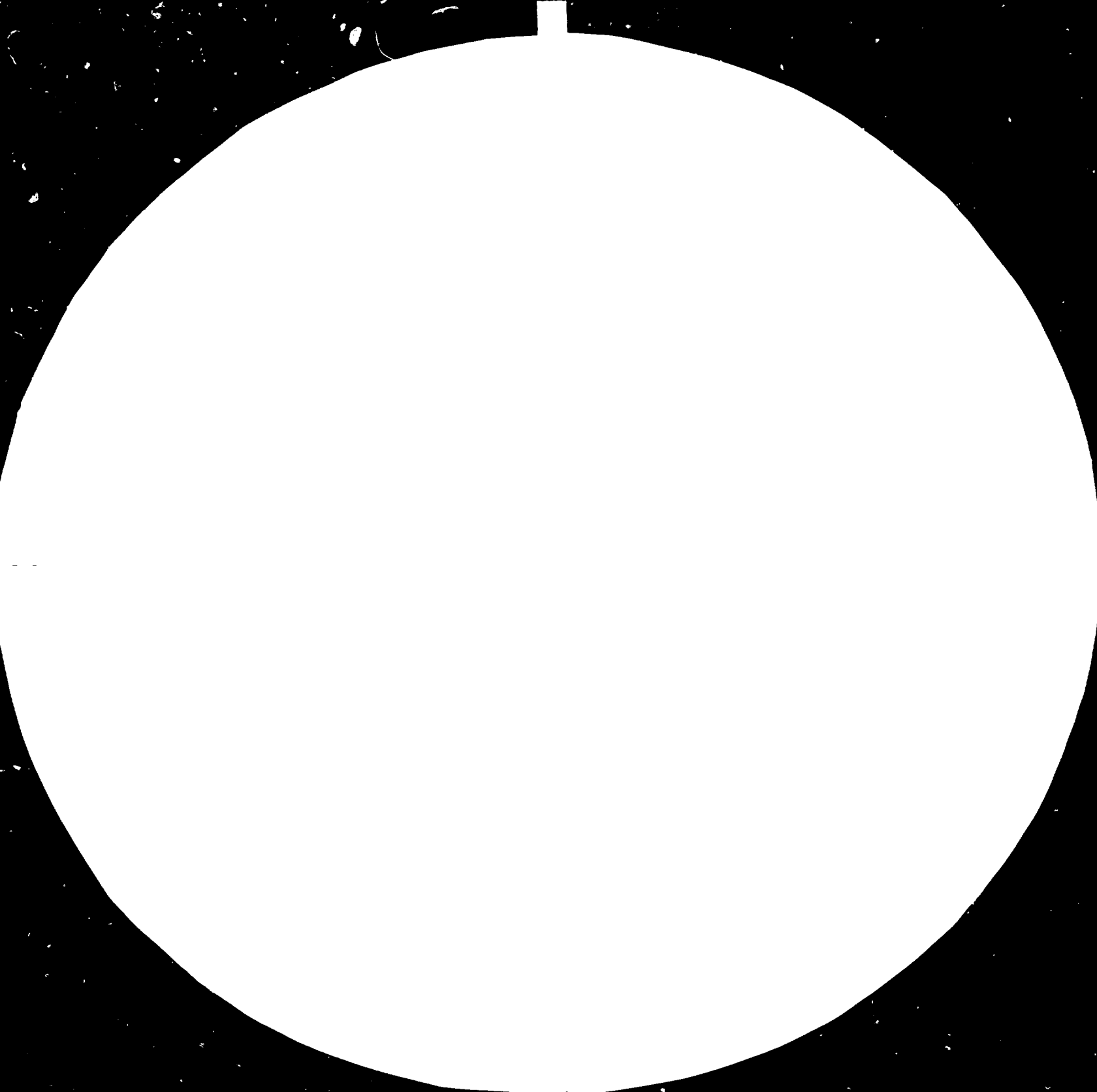
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GENERAL DEFINITION OF DATA PROCESSING MASTER PLAN

FOR UNIDO

23 AOUT 1984

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GENERAL DEFINITION OF DATA PROCESSING MASTER PLAN

FOR UNIDO

1. INTRODUCTION

The "Analytical Report on the situation with regard to Data Processing needs in UNIDO and possible Approaches" :

- listed the weaknesses of the data processing means in UNIDO

- presented orientations which could improve the situation.

A classification of the applications was presented, it comprised the following domains :

- Statistics and Economic Modelling

- Project Management

- Business and Administration

- Data Banks Management

- Word Processing.

The relations between these applications can be schematized in the following way :
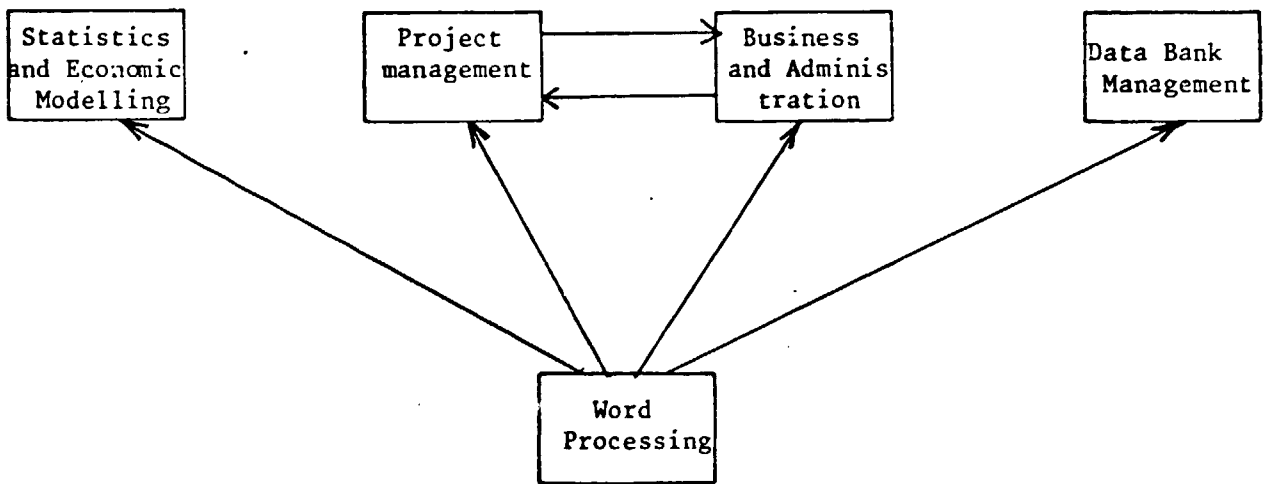
As it is shown, there is an exchange of information between Project Management and Business and Administration (Financial Aspects). Word Processing Activity is a tool communicating with each type of applications (inserting information from the different domains in reports, for example).

The main critics on the today solution are :

1) some applications are not effective (payroll for example)

2) some applications are too costly (ex. : Documents Control, project personnel recruitment system)

3) There is a lack of integration and standardization between applications (ex. : several mailing systems, Administration Applications, word processing)

4) Inadequate computer cost control or tarification (ex. : Statistical Applications, Economic Modelling).

Causes and consequences of this situation are greatly interrelated. So, for example, inadequacy of the computer power offer leads to individual solutions which hinders the efficiency of the overall system. Indeed, this situation stems from a main fact : the lack of an overall data processing plan upon which every concerned manager agrees.

Such a plan will have implications on the following aspects :

1) Personnel
2) Tools
3) Procedures.

On the first one, we will make commentaries. The second one will be treated through definitions of needs or specifications. In itself, this chapter will be a main part of the master plan definition. It is the result of discussions with representatives of the different divisions : in particular, Mr LILLIE of DIS, Mr ROCHE of DIO, Mr CHRISTOPH of Finance and Mr DELOS, President of the computer Advisory Group.

Concerning procedures examples of simplification which can be derived from an extension of data processing uses will be given.

2. PERSONNEL IMPLICATIONS

This chapter comes first, since the retusal of these implications will forbid the implementation of the master plan.

An organization must be adapted to the work it has to do and the tools it can use. This is the condition for a good efficiency.

As the use of Data Processing means is developping, methods are changing, thus the organization must evolve to stick to the new environment.

We can list different points :

1) The use of a computer makes easier, the execution of the work, its mechanical part being done by the computer, it saves employees' time.

2) The use of a computer modifies the way of performing the work and the job assignements, new competences are required whereas the usefulness of some existing competences will become questionnable.

3) In the present situation, the management of the data processing tools is outside UNIDO, in the future it could be in UNIDO hands, then new competences will have to be added to UNIDO personnel.

4) The different points we have listed so far will raise organizational problems :

   - where must the new competences be administratively located

   - how could the staffing table be established to the new work distribution ?

   - how could the responsibility structure be organized to the new situaticn ?

Due to the nature of the UNIDO organization, the adaptative evolution has to be looked upon as a necessity for the future with a quite opened mind.

Concerning the data processing specialists, we may think a little bit further.

To make the best use of computers, different types of expertise are necessary, their position in the organization must depend on their work :

1) Operators and System Engineers

   Their role is to keep the machines running and to make available to the user the grateast possible computing power.

   As their responsibility lies primarily in the computers operations, they should obviously located in a section which is in charge of the computers.

2) System Developpers

Systems Developpers responsibility is to make available to the computer users general software tools like, for example, programming language and Data Base Management Systems. These software tools should match users requirements and contribute to a reduction in the cost of developing applications programs.

These tools can be acquired from outside sources or be developped in house.

As they are more concerned with software tools than with application programs, System Developpers must be gathered together in a specific section.

3) Project Heads (Analysts)

The objective of the project head is to define the goals of a new data processing application and to perform its functional analysis. In general, they describe what problem the new application has to solve, how the users will see it and interact with it, and how the programmers will have to develop it. Project Heads are the interface between data processing professionals and the person in charge of the application.

Very often in a traditional administration organization, these specialists are together assembled in a same unit, but in a multidisciplinary organization, like UNIDO, they can be located in the users sections. It is obvious for the technical applications, it seems also a good solution for DIO applications.

However, communication between Systems Developpers and Project Heads must be encouraged : the former will be made aware of the evolution of users' needs and the latter will be informed of the latest developments in software tools.

4) Data Processing Programmers

They translate functional analysis defined above into computer programs. Depending on the organization, their work can be split in different parts : organic analysis and programming.

Programmers' work requires a good knowledge of the available software tools. In order to improve programmers' expertise, the cross-fertilization of their individual experience should be favored. This can be achieved by organizing them into a specific section.

5) Scientific Programmers

To carry on their work, Scientific Programmers mainly use high level languages and scientific software packages which are easy to learn and use. Scientific must have a good knowledge of their respective application domain : mathematical modelling, statistics, etc...

Owing ot this fact, Scientific Programmers will be located in the users' sections.

Conclusions

The evolution of software tools is producing a displacement of specialization. An adaptation of the organization is needed to take account of this phenomenon.

On the other hand data processing will be in the future the <u>main tool</u> of an organization like UNIDO (UNIDO cannot avoid to have a strong control over this mean). Thus UNIDO must have full control over data processing means.

3. COMPUTER NEEDS

3.1 For Project Management

a) Introduction

One of the main activities of UNIDO is the setting up and the management of specific industrial development projects in developping countries. The work of UNIDO begins with the definition of a project and ends with its complete realization. The different actions taking place being :

- agreements between countries and UNIDO
- research of funds
- recruiting of specialists
- selection of equipment
- following up the realization step by step.

The different tasks are executed by different teams inside the Division of Industrial Operations and for the financial aspects under the control of the finance service of the Administration Division.

To achieve a maximum reliability in this activity, different controls must be organized.

Today the coordination of the execution of the projects tasks is maintained via documents of different kinds which are filled in different parts of the organization. The knowledge of the status of a project, even with these files, is not at the same level everywhere, so decisions cannot be taken without confirmation by services which have the responsibility of the needed information.

Data processing tools can be of great benefit in this type of activity in maintaining a database centralizing all the informations related to each project. This information will be available to each interested person and updated or modified by each authorized responsible.

In the same manner, documents will be edited with the help of computer supplying information and word processing tools.

b) Specifications

The computer configuration which will be able to fulfill the defined needs can be evaluated from three main aspects :

- database structure and volume of information
- number of transactions and treatments which will be submitted to this database
- number of users interacting with this database.

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b1) Data base structure

It is given by the follcwing diagram built from specific rules :

- an entity which corresponds to an object such as project, country, allotment, supplier, is represented by a box

- an arc is linking two boxes if a realization of the entity of the destination box owns the entity of the origin box.

DETAIL FOR FELLOWSHIP
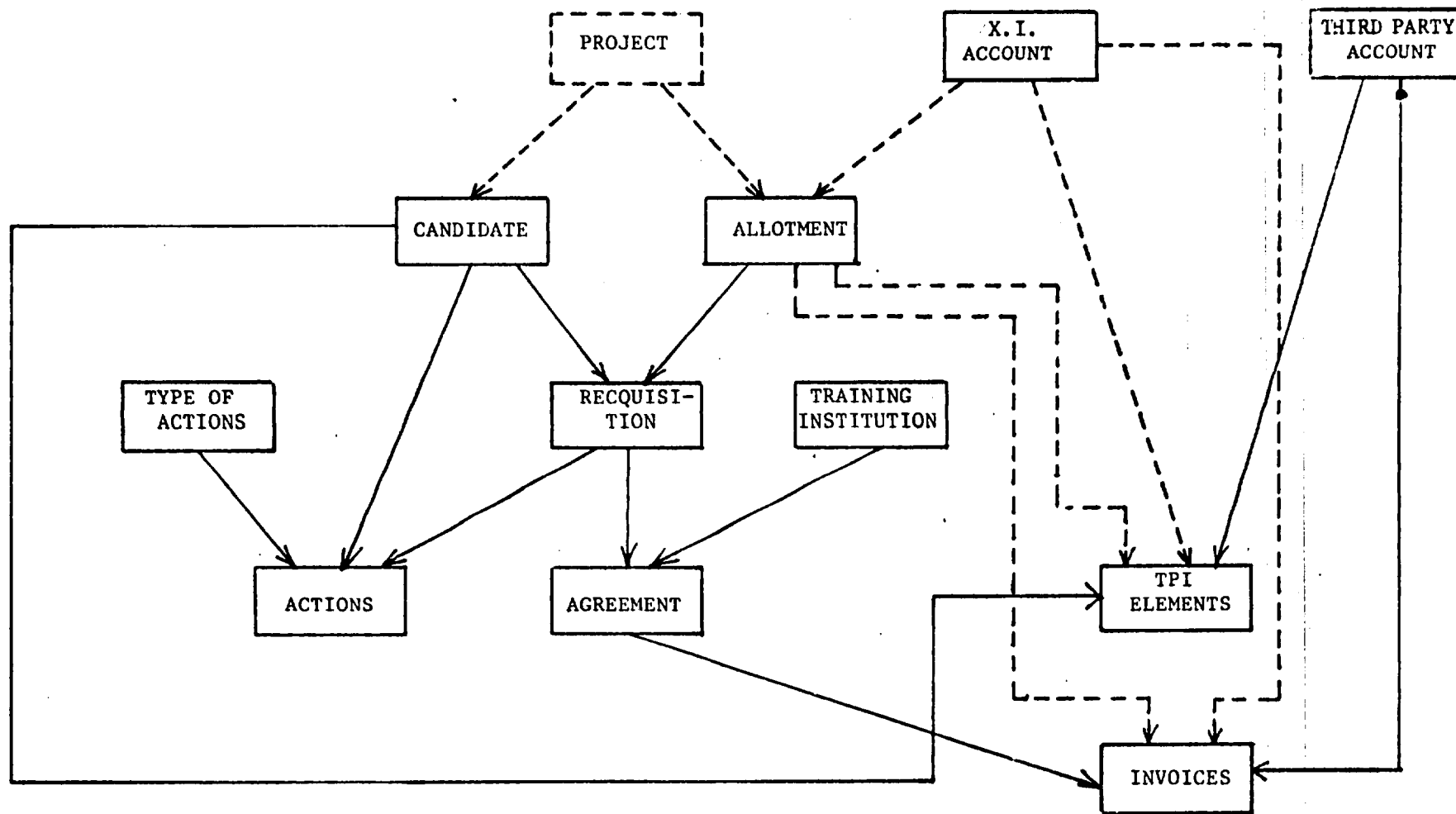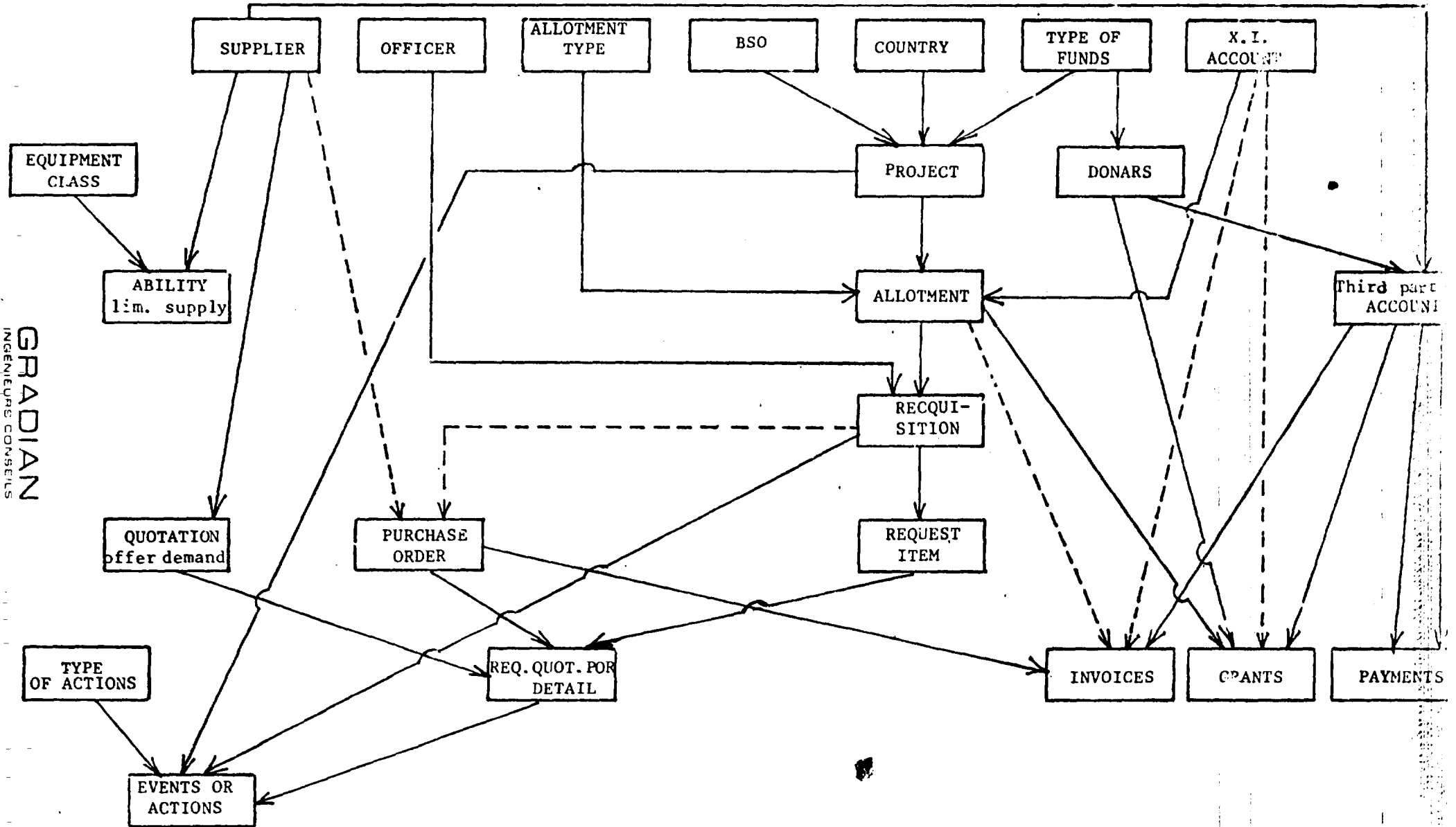
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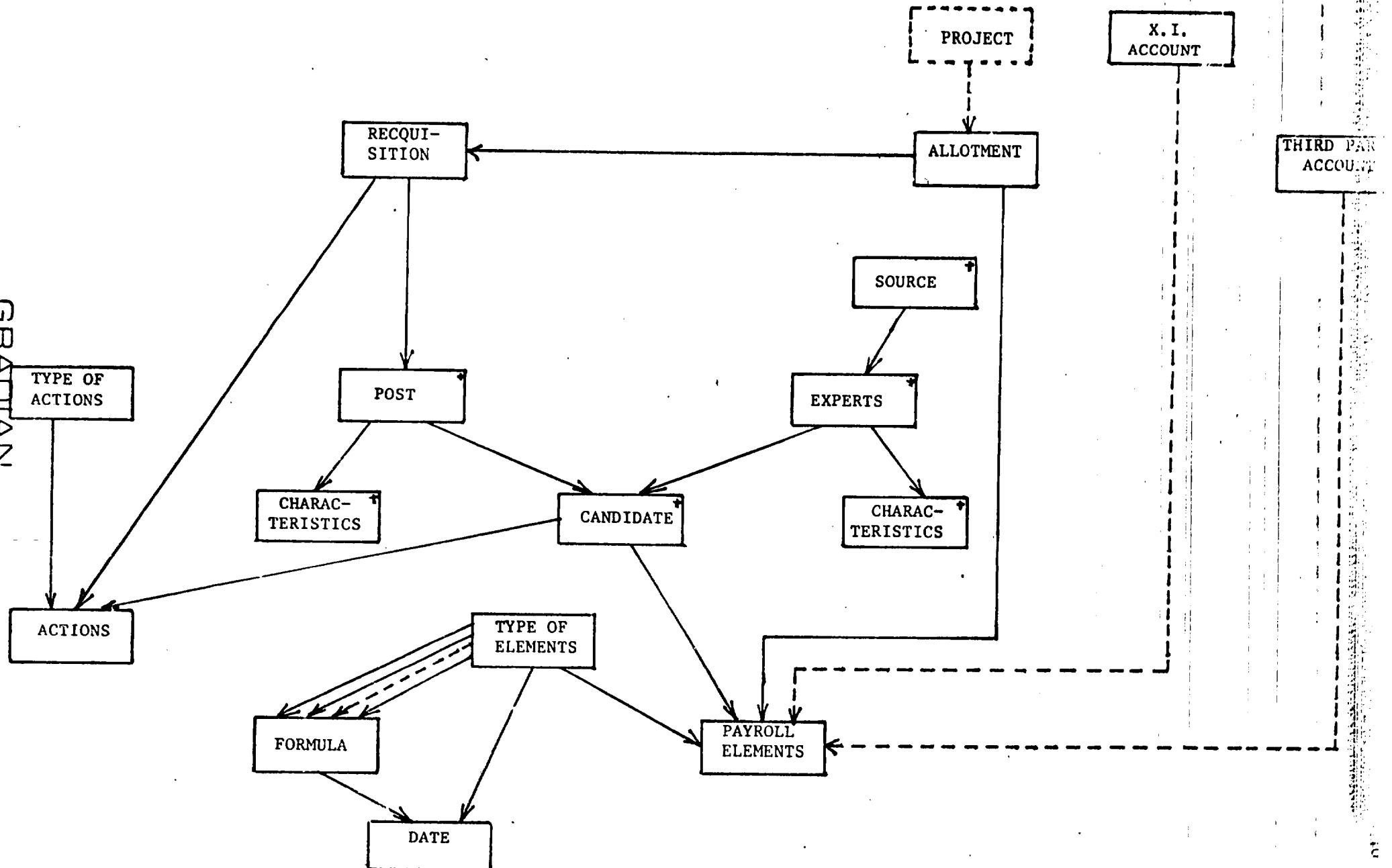
For example, in our application there is an arc between Project and Allotment, because such an allotment must be related to a project. In the same manner, a requisition must be related to an allotment, a quotation to a supplier, an invoice to a purchase order.

Dotted lines have been added since they can be deduced from other links by transitivity.

In the computer, information attached to a specific entity will be included in the record representing this entity.

Representation of information by such a diagram has many advantages ; we can demonstrate that it is unique, it is a good support for discussions between users and data processing specialists, it helps to determine exhaustively information which must be maintained in the system, it gives a concrete view of the consequences of the separation of data base in two systems : for instance financial information from the rest.

For the main entities, the number of realization and the length of information by realization are :

- Project	: Number (included pipe-line) Lenght of information	4 000	
- Allotment	: Number Lenght		
- Requisition	: Number Lenght		
- Requisition Detail	: N L		
- Supplier	: N L		
- Purchase Order	: N L		
- Invoice	: N L		
- Events/Action	: N L	60 000	25
- Experts	: N L	15 000	500
- Payroll elements	: N L	200 000	60
- Candidate	: N L	2 000	300
- Characteristics	: N L	300 000	25

| – Post | : N | 1 000 |
| | L | 500 |

b2) Transactions and Treatments

The main transactions will consist in :

- creating new realization of entity
- modifying or updating it
- consulting it.

Other transactions will concern several entities such as :

- consulting pending actions by project or requisition
- evaluating engagement on an allotment joing through requisition or purchase order or recruitment candidate.

Among treatments, there will be :

- establishing list of suppliers for specific equipments, or list of candidates selected from rosters by comparing characteristics of posts and experts

- establishing documents for asking offer from a supplier, from a training institution, establishing an offer for a candidate

- printing the situation of a project by allotment and by requisition

It appears that there is no complex transaction in a treatment, and the number of occurences for each entity is never so important as to find specific algorithm to minimize access time.

b3) Number of users

The number of normal users of such a system will be evaluated by service, considering that only administrative people will have access to data base.

- Follow up of pipe line projects   2
- Purchase and Contract   2
- Personnel recruitment service   3
- Back stopping officer services   6

With other incidental users, we arrive at 15 connected terminals to which 4 to 5 printers will be added.

c) Functionalities of the system from users point of view

- For projects in pipe-line

When a project is officially recognized as sufficiently serious to be inserted in the pipe-line, its data and characteristics are entered into the computer.

At the same time, specific actions to be taken are defined with the name of a responsible. Steps reached by the project will also

be registered.

At any time, it will be possible to list the pipe-line projects for a country, with their status and pending actions ; it will also be possible to look at similar information for a specific project.

- For engaged projects

As soon as they get information, the finance service will introduce elements of allotments. Requisition will be entered with its detail when it is known ; as the structure shows it, it will not be possible to register any requisition if there is no allotment. Requisition will be validated if money available in the allotment is sufficient.

The document to be sent to the selected suppliers will be automatically edited, so will it be for the purchase order.

. The list of equipement bought for a project will be established on the basis of the invoiced purchase order. Modifications on the specific equipment will be registered in the Event/Action entity.

In the same way, a list of candidated will be automatically drawn from rosters or other sources, by comparing characteristics of the list with characteristics of experts in rosters.

When the selection has been done from this list, an offer can be computer-aided edited. At the agreement of the candidate, the payroll elements will be set up so that his salary will be automatically computed afterwards.

In conclusion, it appears clearly that the availability of information will greatly simplify work, will shorten required time for each action, will reassure hierarchy, having at any time up-to-date information on the different actions to be taken concerning projects.

3.2 For Business and Administration

a) Introduction

The main applications in this field are the payroll and personnel system, the finance system.

As it has already been said, the payroll sytem is inefficient, two employees are fully occupied making corrections of the values computed by the data processing program. The maintenance of the programs, which has been reviewed many times, is also taking a lot of time to programmers.

The finance system is established in a old fashion, each function being separeted. It does not permit its use for treasury application.

The final objective to be considered in the data processing master plan is :

- the definition of an up-to-date and efficient payroll system

- the definition of a finance system which must be homogenous with the project management system, with the payroll system, and able to supply every possible mean for controlling budget and managing treasury.

This aimed concordance between the different systems has many advantages :

- it minimizes the manual data acquisition works

- it simplifies programming in suppressing specific interfaces between systems

- it gives quick and up-to-date information to any interested users.

b) Specifications

bl) Data base structures

the diagram represents the structure of information needed for a personnel ans payroll system.

SECTION DIVISION

GRADE

PROJECT

X.I. ACCOUNT

SUPPLIER CLIENT, EM-PLOYEE, B.A.

EMPLOYEE

POST

DATE

ALLOTMENT

DATE

FORMULA

TYPE OF ELEMENT

DATE

INVOICES PED

PAYMENTS

PAYROLL ELEMENTS

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15
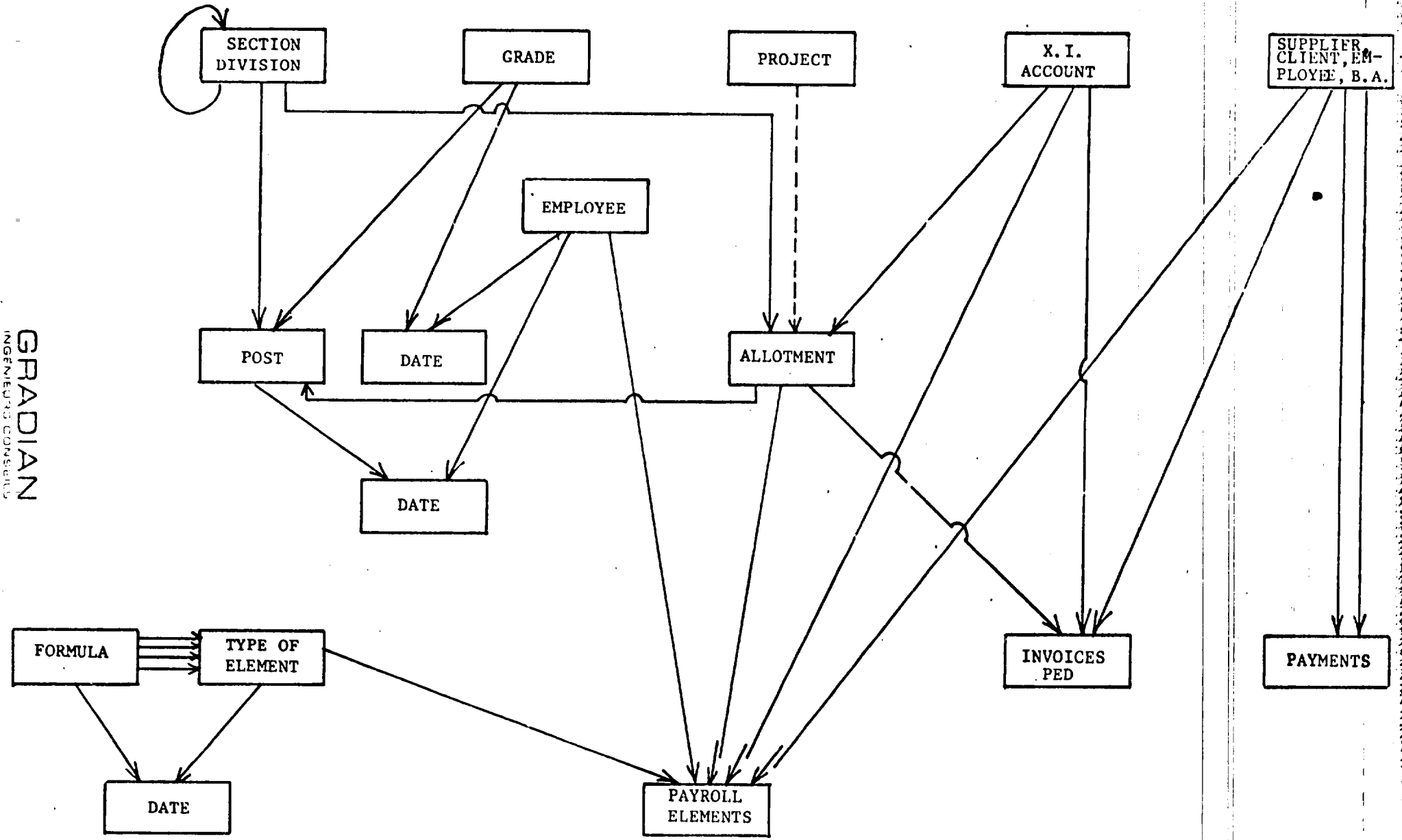
A particular aspect of this graph is the presence of an entity "formula" which relates a salary element to the salary elements from which it must be computed. This formula can be written in different forms : the simplest solution is the reverse polish one which is quite adapted to computer technic.

This solution makes the program easy to write, enlarges the possibility of parametrization and then avoids program modifications when new rules are established.

The volume of information to be maintained can be approximated from the following data :

Employees	Number	3 000
	Length of information (included the different specific attributes like dependants, contract elements...)	
		1 200 characters
Payroll elements	Number	600 000
	Length	100 characters
Payments	Number	length
Invoices/PED	Number	length

These two last entities are finance elements and can be evaluated from the number of accounting writings

b2) Transaction and treatments

The main transactions are again for each entity and particularly for Employee :

- creation, modification, consulting,

for accounting :

- writing creation
- account position and allotment position consulting.

The main procedures are :

- computer-aided creation of payroll elements from Employee and Post data
- edition of the different accounting documents, books and journals.

b3) Users

We can distinguish users by fields of interest which are :

- personnel
- payroll
- accounting
- budgeting (allotment)

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- treasury.

For each one, it is possible to evaluate the number of needed terminal :

- personnel   2
- payroll   2
- accounting   3
- budgeting   2
- treasury   1.

c) Functionalities seen from users point of view

- For Personnel and Payroll

The personnel service will have to maintain information concerning employees, their curricula, the staff table represented by grade, post, division, allotment entities.

When an information which must have an effect on salary is changed, automatically the payroll service is warned and is able to control the modification of the corresponding salary elements. At the end of a month, or at any time, the salaries (or a salary) can be computed with retroactive effect by using summation of different elements for defined periods.

The payroll elements which have a direct meaning in accounting are directly related to the specific accounts.

The payment of salary itself will be a separate function under the control of the finance service.

- For Accounting and Finance Services

A large part of writings will be registered by personnel of other services or automatically by programs like payroll.

For project management, invoices could be "keypunched" by specific DIO services and validated by finance personnel.

Payments on different forms will be prepared by computer programs from rules and criteria defined by the finance service. Final decision depending on treasury management will be taken by authorized responsible.

The finance authorities will have the possibility at any time of controlling the position of allotments : credit versus expense or engagement, the position of third party accounts.

In the Division of industrial operations, they will be also able to look at the allotment situation form their own screen.

It appears in an evident form that the solution presented here which makes information structurally available to the authorized persons without going through complicated procedures, simplifies work and accelerates circulation of information, helps any responsible in the management of its service.

3.3 For Statistics and Economic Modelling

a) Introduction

This activity is almost exclusively done in the Division for Industrial Studies.

The computing power is offered by IAEA with IBM 3081 and IBM 3033 computers.

The main criticisms made to this solution are adressed to the costs system which is sometimes not quite known to the users and which does not allow to use free of charge the unemployed computing power.

In an inside solution, it will be possible to define a budget for computer and afterwards to use computer power during 24 hours a day when it will be necessary.

It must be said also that this type of work is quite apecialised, a specialised solution will surely be more effective.

Another advantage of a DIS solution will be the organization of a deep collaboration between the different branches which could expend in several directions and consolidate their work.

b) Specifications

b1) Data banks

The main data banks are historical data banks which are for the largest ones on tapes, and for the others on disks.

Historical data are defined by :

- nature (for instance : production of a specific ISIC code product)
- country
- year
- version
- value
- descriptive information (sometimes).

This type of information can occupy 10 to 50 millions of characters.

Other data banks are maintained by specific software written with high level languages.

b2) Software cr languages

The different languages used are :

- Fortran
- PL1.

The following systems are used :

- SAS with PROC Matrix

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- ADABAS with Natural and a specific access language written in PL1 : SLANG.

The SAS system is used for maintaining small and temporary data banks, for statistical procedures, for manipulating data, for writing large and medium economic models of 500 to 5 000 equations.

Different subsystems are written in PL1 or Fortran for executing periodical treatments or for maintaining specific data.

As examples, we can cite :

- apparent consumption system
- I/0 tables management
- trade decompress system
- trade data selection.

b3) Other applications

Besides Data banks Systems ans large economic models, a large variety of applications are executed inside DIS. They can be classified according to these different types :

- selection of data from one or the other data bank in different quantities (10, 1 000, 10 000, 100 000)

- aggregation in several ways

- econometric treatments, statistical analysis

- correction or addition of values in the different data banks

- edition of tables or graphs.

b4) Configuration

The number of terminals used is around 10. They are connected as said before to the IBM 3081.

An alternative solution could be offered by a minicomputer to which video terminals could be connected, and also microcomputers. The power of the minis can be defined by the number of connected terminals (10 to 20) and by the computation power of the CPU which must be around 1 MIPS.

The connected micros would be run under the same operating system as the minis, in order to simplify communication and programming.

Concerning other peripherals disks memory size must be of the order of 300 Megabytes. Two magnetic tape controllers must be connected. Different printers will be necessary one line printer, matrix printers having graphics capacity.

b5) Softwares

The description of the systems and languages used in the different application will militate to get identical tools in this alternative solution.

However this constraint may forbid any solution other than the existing one.

So defining specifications at the functionnalities level only, the supplied software must include :

- a high language of the Fortran type
- a data base system : an efficient relational data base could be a solution if its setting-up is made easy by an adequate language
- a data manipulation and statistical package
- a matrix language for large econometric models.

3.4 For Documentation System

a) Introduction

There are two different documentary data banks :

- those concerning documents (books, articles, publications)
- those concerning mailing lists.

It has appeared interesting to consider these data processing applications for themselves since they are for most of their needed features quite similar.

In the today situation, several softwares are used for these applications ; different even for the same type of uses.

Unification in this field will bring simplicity, diminution of the maintenance effort, and again will allow the use of specialized equipments.

b) Specifications

8 different data banks are maintained inside UNIDO, 4 concern document-type files, 4 concern addresses. The volume of disk used for those data banks varies from 4 MB to 40 MB, with a total of approximately 150 MB. 6 or 7 simultaneous users may access one of those data banks.

At least one of those data banks must be relatied to a thesaurus with a hierarchical structure from narrower terms to broader terms.

In general the files will contain three types of information :

- formal information, like :

        Date
        Author

        •

        Address
        etc...

- text, like :

        Content
        Abstract

- keywords to which fields of formal information can be added (ex : name of the author).

Today for some of these applications CDS/ISIS is used at the satisfaction of the responsibles.

c) Functionalities

The system must permit an easy parametrization of the formal information structure, and of the images for manipulating it (Data entry, consulting...).

A walking practice inside the thesaurus must be foreseen to help users to precise their questions or their selections. A selection will be done from a formulation based on formal information and on keywords.

Different types of edition will be asked for :

- edition of the formal information of list of selected items. Mailing list will be an example of this type of job

- edition of the full document without keywords

- edition of the list of keywords by document or vice versa.

The interactive up-dating of documents will happen mostly for mailing list in the control phase at the entry of the address or at its modification. The interrogations will be done most part of the time interactively even if the final edition is executed through batch programs.

To have an overview of the movements at which the data banks are submitted, we can give some statistics. Growth of data banks is around 10 % a year. Modification are almost in the same proportion. There are around 10 consultations a day in total, besides other interrogations for selction and listings, which happen 4 to 6 times a day.

3.5 Word processing - Office automation

a) Introduction

Today a network of word processing terminals connected to 2 CPU Wang is functioning at UNIDO.

These minicomputers are used mainly for text editing, even if some small applications of office automation are run at some places. One or two services are using micros for this type of application.

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One characteristic of the system used with the wang systems, is its centralized independent organization : centralized since there is one CPU for 10 terminals ; independent since this network is not connected to the other machine, i.e. IBM 3080.

This leads to a situation where data are manipulated first by a computer, then keypunched again on a Wang terminal for inserting them in a report. It is a source of error.

An ideal solution would be characterized by :

- autonomy
- communication.

User who has to write a simple document must be able to work on his terminal in complete independence, but if necessary for him or interesting for others, he can exchange information or texts, or tables, through the computer network.

b) Specifications

For the four precedent types of applications, we have left the possibility of defining independent solutions. As we have just seen, a flexible solution for word processing and office automation will need communication facility with each of them. That would be a contraint also for them.

Configuration will be made of autonomous terminals -in the sense that they can work independently of other systems for word processing and simple office automation tasks like agendas, management of small files- and of common terminals working on centralized CPU's. These CPU's may be either those of the machine defined for the other applications or dedicated to office automation.

In fact, word processing facilities must be accessible from any computer termnal or micro. It means that software for this type of application will be totally transparent to users, i.e. from any terminal, autonomous or not, the same word processing functions must be activated in the same manner, and have the same effects.

The advantage will be a simplification of the computer network to be installed : today there are at least two networks, one for IBM 3080, one for Wang system. It will also minimize the number of terminals, if they can be used for different types of jobs :

- statistics and word processing
- business application and word processing
- project management and word processing.

c) Functionalities seen by users

c1) Word processing

The word processing system must contain the normal and up-to-date features. And, as said before, there must be no difference of functionnalities if this software is used from autonomous terminals or connected terminals.

c2) File management

The autonomous system must have the capacity to memorize files. But it will have also the facility to search a file on peripherals of connected minicomputer, and in the other way to store files on disk ot the minicomputer.

c3) Internal message mailing

Possibility for one user from his terminal to send an information to another user who will be connected to another terminal.

c4) Search and classifying

this functionality must be applied to small and medium files, personnel documentation.

c5) Agendas

Functionality helping the organisation of meetings ; "aide-mémoire" for plannings.

4. OVERVIEW ON THE SYSTEMS

After having studied each domain of data processing applications, it is interesting to have an overview of the systems in their interrelations, more especially as office automation is strongly linked to others.

a) Existing systems

   a1) Hardware aspects

   From hardware point of view the existing system can be schematized as it follows :

3081

WANG

WANG

TERMINAL
FOR WORI
PROCES-
SING

TERMINALS FOR EDP
SPECIAL APPLICATIONS
DIS
DIO (PPRS)

MICROS FOR SPECIAL
APPLICATIONS
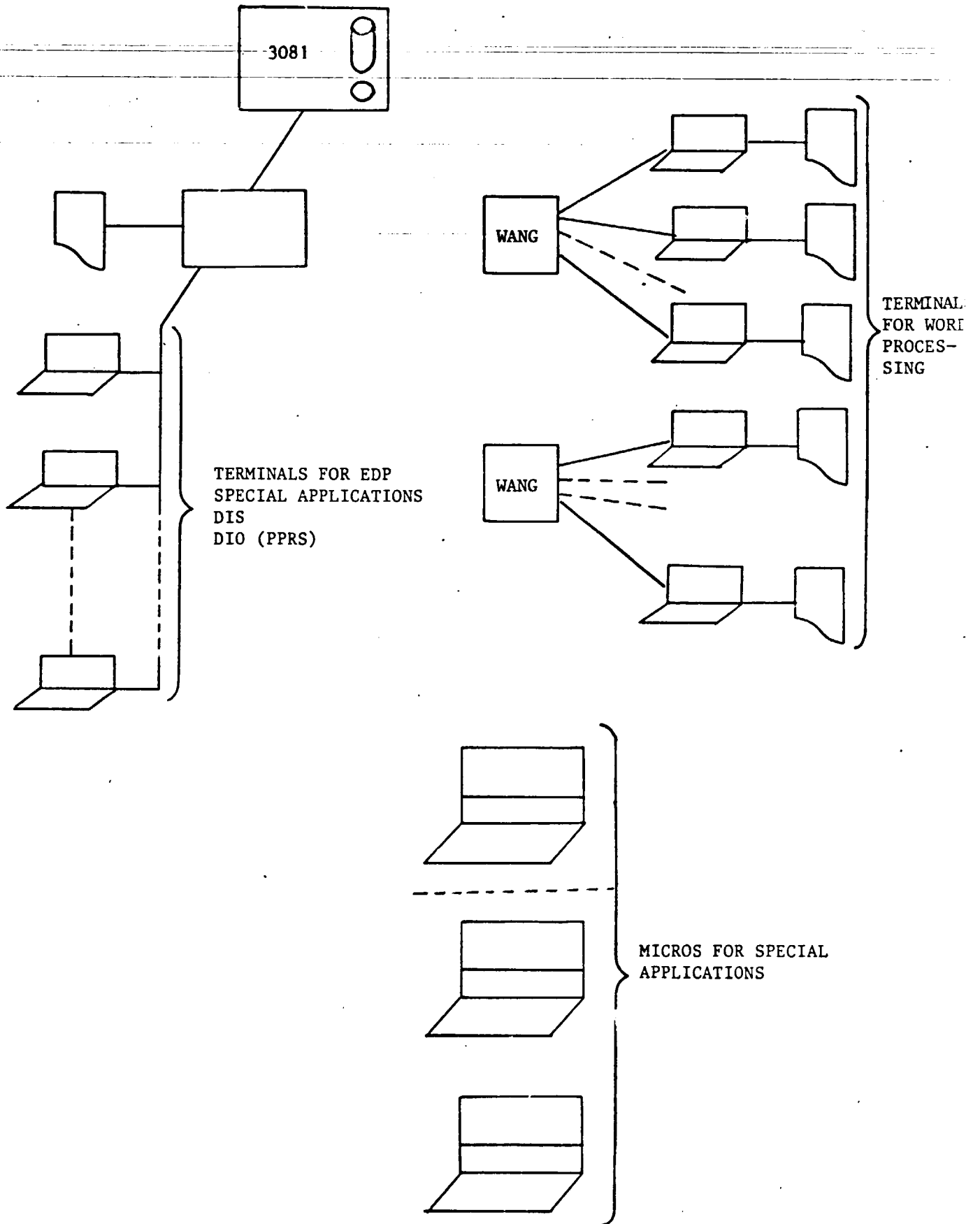
It is characterized by :

- terminal specialization
- absence of communication, especially with word processing.

a2) Software aspects

The same criticism can be done concerning the software aspects :

- the operating systems used on the different machines are incompatible

- in consequence, an application used on one system cannot be used on the other one

- moreover very often, similar applications running on the same machine for different users are different.

b) Future solution

b1) The figure below is representing the data processing "infra-structure"
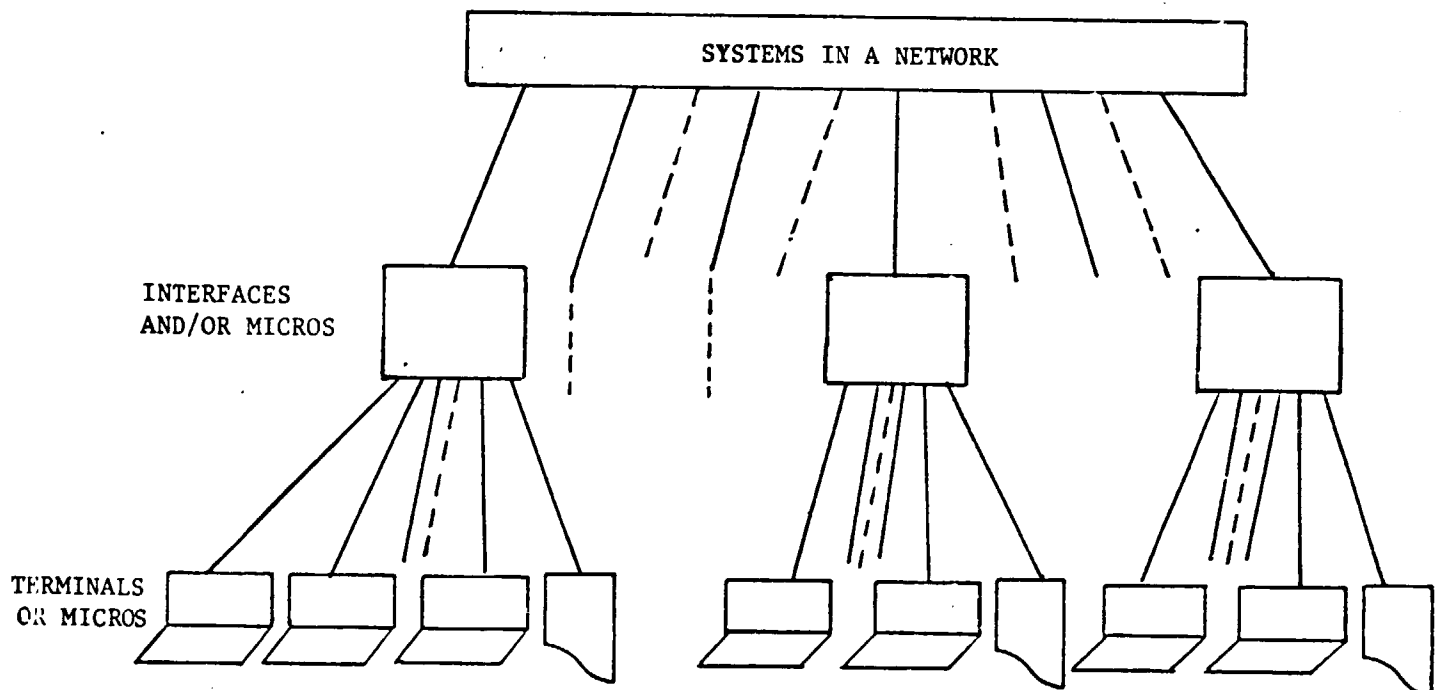
It can be decomposed in two levels :

1) system network
2) terminals or peripherals or autonomous word processors or micros.

The system network could be made of :

- one system
- several specialized systems linked together as long as it is necessary.

The first solution would be realized by a large general purpose main frame. One of its inconvenients will be the need for a strong team for operating it.

The second solution will stick more closely to the UNIDO needs in supplying each type of applications with an appropriate minicomputer. However communication can create problems. In this case, the figure could be precised as it follows :
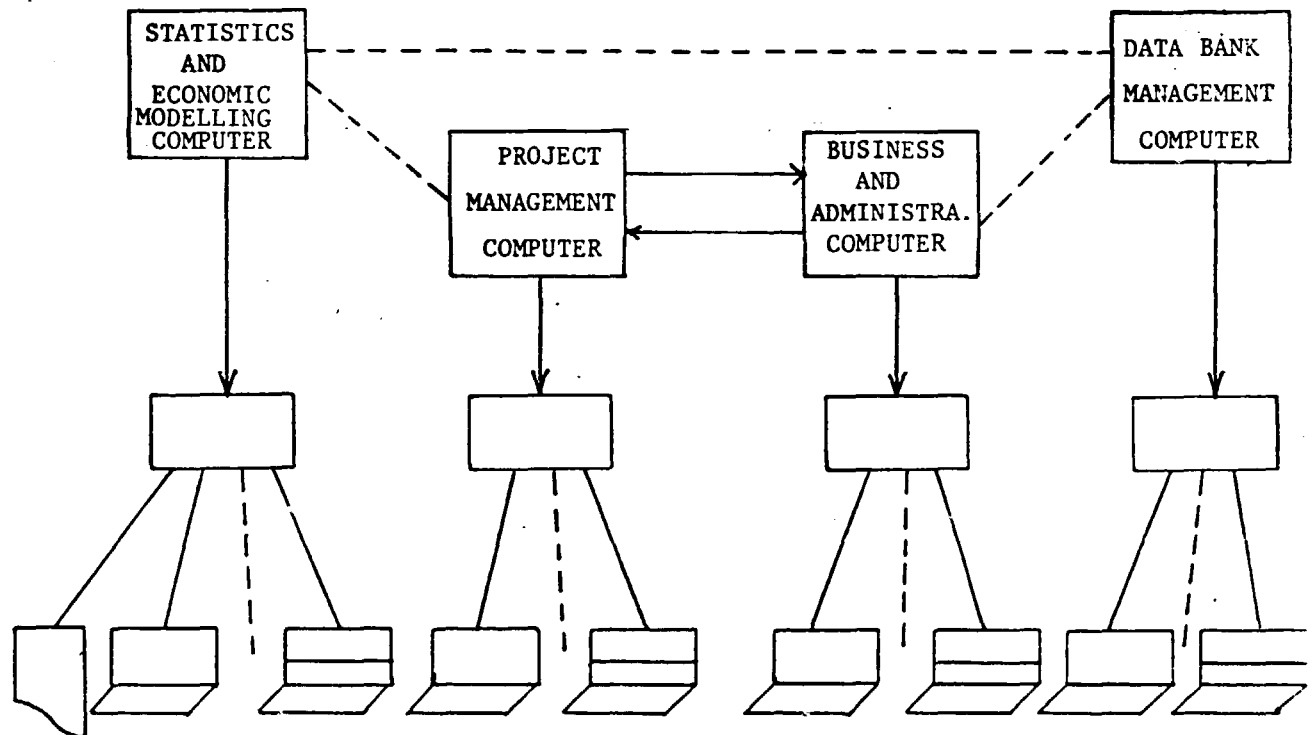
The terminals may function as word processing terminal, or as general terminal for the application running on the computer which they are connected to.

Word processing autonomous system can be connected at either machine, as it can be for microcomputers.

The dotted lines of the diagram represent less necessary connections between computer or applications. It shows that beside the interest to have common word processing treatment on every machine, the data bank application and the statistical and economic applications systems may be looked as independent from others.

b2) Software aspects

The similarity of the different operating systems is certainly interesting or necessary. One exception could be accepted for the data bank computer, if the machine and the applications are supplied as a turnkey system.

It is interesting to say that the UNIX operating system could be a good choice since it is becoming a standard among this type of machines. With this choice, word processing, office automation facilities will be automatically the same on the different machines if the choice of micros is also guided by this criterion.

For software closer to applications, compatibility has just to be respected between business and finance application, project management applicaitons, for their common informations concerning allotments, engagements...

It is interesting to present here the interest, for some business applications, of using relational data bases which make easier developments.

5. PLANNING

After having defined the future solutions, it is useful to see how it is possible to reach this objective.

Two considerations must be taken account for defining the planning :

- the personnel
- the relative urgence for the different applications.

The problem of personnel has already been discussed at the beginning of this note. It was noted that there will be modification of type of work. So knowing that specialists for new developments are rare at UNIDO, it will be desirable to begin with the applications which, when running, will save several employees which could be transferred person by person, or post by post, to data processing jobs.

It must be recalled that it is possible to find, for hiring at "G" level, in several countries, good analyst-programers.

Coming back to the criterions for planning, the first one will have effect on project management system and business applications, the second one will apply mainly to statistical and modelling systems, but also to word processing.

The data banks application can be transferred to a new system at any time. The benefit will be mostly financial, but also functional.

For the following, it is assumed that :

1) A decision has been taken on what could be the future of data processing inside UNIDO and the long term relations with IIASA in terms of computer services.

2) Depending on these decisions, for systems which will be managed directly by UNIDO specialists, specifications have been sent to computer manufacturers, answers have been received and choices have been made.

5.1 For data processing and business applications

1) The payroll application is the most urgent system to be reconsidered and rewritten or acquired from outside. This system must be used for staff people and expert people. An inside development could cost 2 to 3 man-years. It will save 2 to 4 people at least.

2) The accounting, budgeting, treasury applications seem less urgent. However it will be interesting to have an overview of this system in its future organization before defining the interfaces with the other applications like payroll, project management and so on.

3) Other applications

The list of UNIDO computer systems shows that most systems are part of one of the following applications :

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- payroll
- accounting
- data banks (documentation, mailing list)
- project management

and in this report are considered as such.

The other main applications are :

- documents control system
- inventory control system.

Those 2 systems will be more economic if they are reprogrammed in a minicomputer environment with a relational data base approach.

5.2 For project management

This application can be considered as one in the sense that it must be integrated in one structure.

However the objectives given to this application can be ranked following their relative urgence.

This order could be :

1) P.A.C. the tool used today has to be replaced.

2) P.P.R.S. The benefit of reviewing this application with a better suited equipment, an adequate data base and an integrated word processing will accelerate the operation for hiring experts, save posts and save money.

3) pipe-line projects follow up. As the information structure includes information for pipe-line projects, it is interesting to take this opportunity for managing the actions on them.

4) Fellowship project

5) Group Training Project.

As seen in the figure, the information for controlling budget and allotment will be included in this application.

The planning for this development could be organized around several phases :

1) Selection of the computer, and of the software tools : languages, data base, word processing.

2) Detailed analysis of information structure and content.

3) Development of PAC modules, installation and starting up.

4) Development of PPRS modules, installation and starting up.

5) Development of other modules.

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INGENIEURS CONSEILS

At some points, interactions with the accounting system must be organized. The way it will be done will depend on the respective computers and technics used.

The time budget for the development plans will vary according to the tools which will be available.

A realistic evaluation coudl be :

phase 2 :	Detailed analysis It would overlappe with the subsequent phases	6 man-months
phase 3 :	PAC application development	6 to 9 man-months
phase 4 :	PPRS modules Roster data banks and selection tools	4 man-months
	Procedures follow-up	6 " "
	Automatic edition of documents with help of word processing facilities	6 " "
	Translation of data for payroll program	4 " "
phase 5 :	General modules for project management (pipe-line phases included)	6 " "
phase 6 :	Modules for other projects types	6 " "

After this evaluation, it is important again to note that the time of employees saved by this application will be, already in one year, greater than the total time invested in the development.

5.3 For statistical and economic modelling

In order to acquire the essential conviction of the users, it will be necessary before the final choice to make trials.

So the approach may be as follows :

- to select two or three computer manufacturers
- to send them specifications
- to ask suppliers to realize, with their offered tools, benchmarks on applications samples representing main computer uses. Benchmarks will have two goals, to evaluate the software tools in looking at the time necessary to set up an application, to control the power of the machine in measuring the computer time spent to run a program
- to make the choice of the best solution.

It must be recognized that, in this field, a change of system will, during an intermediary period, be more expensive than the existing one : since it will cause some programs to be rewritten. The relative economy of a new solution will be judged in a medium or long term.

As already said, a secondary benefit of the management of a common computer center for DIS will be the creation of a collaboration kernel between branches.

5.4 Documentation data bank and mailing list

The planning of implementation of a new solution for this field is very easy, since the supplier will offer a "turn-key" solution.

The only problem will be raised by the transfer of data banks from the IBM today system to the new one if an offer is satisfactory.

5.5 For office automation and word processing

A solution which fulfills the specifications defined before, will exist if a coherent choice has been possible for the other applications.

Hoping that it will be the case, the evolution from the Wang solution to the new one will go step by step, in stoping the acquisition of other wang terminals if their solution is not selected, and acquiring the new equipments in function of the demand. In parallel, new equipments will replace the elder one which can be transfered to offices for which the need fo communication is null. Conference services have almost no computerized information which has to be inserted in their published texts.

6. <u>COSTS</u>

The costs of data processing have three components :

1) Costs for hardware which can integrate the cost of manufacture software and the cost of maintenance.

2) Operating costs which include the cost of the team which has the responsibility of running the system.

3) Applications software costs or development and maintenance costs.

It is not envisaged to detail these costs, but to give an idea of what they could be.

Applications software costs have been already given through the evaluated time budget for the main one.

For Statistics and Economic Modelling, the cost of the new developments caused by the eventual computer change is not possible to be estimated if we don't know the tools which will be used.

So the two first components will be considered.

6.1 <u>Hardware Costs</u>

As it has been said in the first chapter, the different applications could be run in the future on a Main Frame computer in the same philosophy as the existing one or on different mini-computers.

It is this last hypothesis which is interesting to be looked at :

- A computer (1.3 MIPS) for Business Applications with 15 terminals
  Disk (600 Megabytes)
  tape Driver
  line printers

  will cost approximately 250 000 $, software included.

  Its maintenance must be budgeted at around 1 300 $/month.

  For project management and Statistics and Economic Modelling devoted configuration will be described in the same terms and will have the same level of cost.

- A computer for Data bank application will need less power. It can be defined for 10 terminals, 300 Megabytes on disk, a tape Driver, printers

  will be evaluated at 160 000 $ to which 960 $/month must be added for maintenance.

6.2 <u>Operating Cost</u>

Based on the experience of mini-computer operating, we can estimate that for a specialized type of applications, the operating will need :

- 1 operator (G level)
- 1/3 of a system-programmer (P level)

for the 3 main mini-computers.

For the data bank one, 3 days/month of a system-programmer will be needed.

CONCLUSION

The future of Data processing or computer technology in UNIDO may appear differently in the range of the possible solutions, placed between the current situation and the ideal integrated system which has been drawn in this note, and which comprises several alternatives.

The set of solution is defined by the degree of integration between the systems which will be devoted to each domain of applications. The alternatives are given by the communication network which can exist inside one computer or between specialized hardwares.

The criterion for choosing a solution will be based on costs, it will lead to a compromise between short term and long term costs, between investment and operating costs. The alternative will be selected from a management criterion : serveral small decentralized units could be more effective than a control team too far from users

Beside those choices to be made, it appear clearly that a computer field master plan has to be adopted in order to give a direction for decision to improve the effectiveness of applications, to diminish their cost and in the same way to save personnel time.

Project Personnel Recruitment Section

List of Computer Files

1. **Roster:**
   number
   name
   address
   nationality
   telex
   phone
   source of entry
   date of application
   date received
   date current P13
   areas
   functions
   background
   level
   specializations (languages; preferences; indicators)
   date evaluation by Substantive Section request
   date evaluation by Substantive Section received
   evaluation
   name of evaluator
   date interview report requested
   date interview report received
   interviewers evaluation
   interviewers name
   date reply to candidate

2. **Post:**
   Title, Duty Station, Duration, Phasing
   Buli
   date J.D. received
   requirements:- area
                   functions
                   background
                   level
                   specializations
                   languages
                   educational level

3. <u>Request to Recruit:</u>   date

date received

man-months requested

EOD requested

BSO

cooperating section (if any)

cooperating officer (if any)

date fund check or

date advance recruitment approved PHR

date RO to RG

date RG returned to RO

RO's evaluation

date RO to BSO

date received back

BSO's evaluation

date of letters to candidates as to interest and availability

date submission to Government

date of candidates replies

date available

date of letter to Government advising whether candidates are interested and available

date of request for interview report

date interview report received

interviewers evaluation

date of Government's reply

Government's evaluation

date of cable to Government's first choice

date of memo. to UN/NY re. US investigation report (US cases only)

Request to Recruit: (cont'd)	date of memo. to US Govt. re. section 8 clearance (US cases only)
	date of Notice of Candidate selection (IOD.15) to BSO
	date of letter to candidates Government requesting his release
	date US clearance received
	date Government release received
	date of letter from candidate confirming availability (amend EOD date if necessary)
	date letters to unsuccessful candidates
	briefing requirements
	date P5 sent to Finance
	date certified
	date 10.32 sent to Chief, PPRS
	grade/fee
	duration of contract
	nature of contract : new, extension, return visit, split mission
	type of contract : RA, AE, RL, OPAS, SSA
	date case sent to AU
	date of offer
	EOD, COB
	date offer mail
	date accepted

4. Entitlements:

	Country Related	Duration Related	Family Related	Contract Related
Fee				x
Salary : Gross		•	•	x
: Net			x	x
Separation pay : Gross		x		x
: Net		x	x	x
Pensionable remun. : Benefits/ Contributions		x		x
Pay in lieu leave				x
DSA : up to 60 days	x	x	x	x
: over 60 days	x	x	x	x
Assignment allowance	x	x	x	x
Installation Grant	x	x	x	x
Travel expenses		x		x
Annual leave	x	x		x
Family travel	?	x	x	x
Rental subsidy	x	x	x	x
Childrens allowance		x	x	x
Ed. Grant		x	x	x
Ed. Grant travel		x	x	x
Shipment of Household effects		x	x	x
Designated Duty Station allow.	x	x	x	x
Transportation car		x		x
Repatriation Grant		x	x	x
Post Adjustment			x	x
Medical scheme subsidy		x		x
Group Life Insurance subsidy				x

5. Underline: Funds: group

         Source of Fund

         code

6. Roster codes and escriptors:

         areas : codes and descriptors

         functions : "

         background : "

         level : "

         specialization : "

7. Donors: name

         address

         nationality

         code

8. BSOs   name

         unit (PPCSA)

         section

         Division

         room

         phone

9. NRS   name

         address

         code

10. Country: name

         alpha code

         numeric code

         country specific entitlements

          Post adjustment multiplier

          Assignment allowance

          DSA up to 60 days

          DSA over 60 days

          Installation Grant

<u>Country</u>: (cont'd)

          Annual leave

          Rental Subsidy

          Family Travel ??

          Designated duty station allow.

Visa requirements

Health regulations

          Innoculations : mandatory

                         : recommended

11. <u>Res. Reps</u>   **name**

                    address

                    phone

                    telex

12. <u>SIDFAs</u>:   **name**

                    address

                    phone·

                    telex

Computer Files for Fellowships and Study Tours

1.   Candidates: date nomination received
name, address, sex, nationality
Educational level reached
date of birth
Field of study requested
man-months requested
man-months approved FSTU
estimated cost
date sent ESO for evaluation
date received back from ESO
evaluation
date of letters to Res. Rep. and candidates
date of letter to NSA(s)
name of NSA(s)
date confirmation of placement received
man-months confirmed
EOD, COB
date TPI
number TPI
date of letter to Res. Rep. enquiring if
candidate available
who pays stipend/allowances: o   UNIDO
                                o   Other (specify)
who provides ticket   o   UNIDO
                                o   Other (specify)
special information and instructions
itinerary
travel mode
latest date for arrival

termination allowance: cost

international travel : cost

tuition fee   : cost

date sent to Finance for certification

date certified

instructions to Wagon-Lits Cook

date medical form received

date letter to NSA confirming candidate available

2. NSA^S: name

address

phone

telex

contact

3. Places of Training: name

address

phone

telex

contact

4. Res. Reps: name

address

phone

telex

contact

5. SIDFA^S: name

address

phone

telex

6. BSO^s: name

      unit/FPCSA

      section

      Division

      Room

      phone

7. Countries: usual basic data

      monthly travel rate

      residential rate

      rates of exchange

8. Book Allowance: $30 pm.

9. Local Travel and miscellaneous: $50.

PURCHASE AND CONTRACT SERVICE

List of Computer Files

1. BSOs: name, unit, section, division, room, phone
2. Procurement/Contract Officers: name unit, room, phone
3. Countries: name, alpha code, numeric code
4. Vendors/Contractors: name, address, nationality,

    character e.g. manufacturer etc. (vendors only)

    contact point

    telex, phone

    specializations, IAPSU codes

    source of roster entry

5. SIDFAs: name, address, telex, phone
6. Res. Reps: name, address, telex, phone
7. Requisition: date, number, special instructions, date

    received by PO/CO

    : target date for delivery to project

    : total value

    : consignee, name and address

8. Requisition items: number of item

    quantity

    unit

    unit paid

    item code

    description

    estimated cost

    date short list of invitees established and sent BSO

    date BSO's assessment received

    date proposals invited

9. Quotation: date proposal invited

date received

amount quoted

PAC's assessment

date sent BSO

date received back

BSO's assessment and ranking

date submission to committee on contracts

date decision received from Director of Administration

award and financial rule under which made

10. Committee on Contracts: meeting number

meeting date

11. Purchase Order: date, terms of delivery, shipping and payment, notes

date certified

date mailed

date acknowledged

12. Invoice: date, date received, number, amount in stated currency

transport mode, bill of lading/airway bill number

date of despatch

date letter to vendor/contractor for correction/ clarification

date reply

amount paid in dollars

date paid

13. Claims: date notice of loss/damage received, case number

date preliminary claim

amount claim

claimee

date letter to field requesting documentation

date reply from field

date formal claim

date claimees reply

amount received, amount declined, reason for decline [a]/

date draft sent to Finance, date credited, amount credited

14. Writes-off: date notice of loss/damage received, case number

date letter sent to field requesting further documentation.

date reply

date submission to PSB [b]/

date PSB's decision

PSB's reference number

date Resident Representative notified

date removed from inventory

15. Sales: date request received, case number

date letter to field requesting further information

date reply, date submission to PSB, date PSB's decision

PSB's reference number

date removed from inventory

date 'Notice of Sale' sent to field, date received back

date of sale

16. Transfers project to project: date request received, case number

date memo to ESO, date reply

date permission sent to field

date removed from inventory

17. Transfers from project to Government (general project equipment):

date request received, case number

date memo to ESO, date reply

date removed from inventory

date blank 'Transfer of Title' sent to field

date received back, date transfer

date copy sent N.Y.

[a]/ amounts declined then become writes-off for submission to PSB – see 14b below.

[b]/ including claims declined in whole or in part by claimees.

18. Transfers from project to Government (vehicles and office equipment):

    date request received, case number

    date memo to ISO, date reply

    date letter to Resident Representative to complete AD.91

    date reply

    date submission PSB

    date decision, PSB reference number

    date removed from inventory

    date blank 'Transfer of Title' sent field

    date received back, date transfer

    date copy sent N.Y.