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GUIDELINES FOR THE ESTABLISHMENT OR REDESIGN OF INDUSTRIAL AND TECHNOLOGICAL INFORMATION SERVICE SYSTEM, INCLUDING SELECTION OF SOFTWARE AND HARDWARE*

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I Introduction

Industrial information is widely recognized, both in technology transfer and in management of industrial activity in developed and developing countries.

Its role is of paramount importance in any decision-making process where the need arises to find a solution for industrial problems.

The collection, storage, processing and dissemination of industrial information requires well established formal information facilities, which, together with informal information channels, contribute to the satisfaction of the needs of diversified categories of industrial information users.

These guidelines have been prepared with this view in mind. Their purpose is to provide practical guidance for the organization and management of industrial information services and systems, especially in countries with limited experience in this field. The guidelines describe precisely: concept formulation of industrial information systems at the national level; methods of evaluation of industrial information needs; methods of evaluation of existing information activities; information handling methods; hardware and software specification and selection; networking of information systems and services.

The guidelines are primarily intended to serve those involved in the planning, establishment and development of national industrial information systems or services. They can also be used for general training purpose by all those who, not having special industrial information competence, are nevertheless involved in industrial activity.

This condensed volume of guidelines, and its aim - to provide advice to users in countries with different levels of economic development and socio-political orientation - predetermined its general, introductory nature. It should be considered as a checklist which reminds the user of what he should take into account when planning an industrial information service rather than providing a solution. It is not conceived as a compendium to design or redesign information systems. It refers the user to appropriate literature largely cited in the bibliography for further consideration.

Chapters 1 to 5 of the guidelines are compiled by A. Wysocki; chapters 6 to 10 by J. Bankowski.

II How to use the guidelines

The guidelines are meant to be an introductory material for the persons responsible for industrial information services at the national level. As it was mentioned before they do not contain the complete procedures to be followed when industrial information system is going to be designed or redesigned but focus the attention of the reader on the factors that should be taken into account. No prerequisites are needed to study the guidelines. For newcomers into information world the guidelines should be read sequentially, i.e. exactly as they were written. For readers of with some experience in the field some parts of the material may be skipped or read non-sequentially as it will be pointed out at the end of this subsection.

The first chapter deals with the general concepts of industrial information system at national level and explains its role and links with other parts of national information system. The main topics discussed in this chapter are:

- various aspects of access to information
- general remarks concerning the organization and management of information systems
- development of information systems and services
- government responsibilities

The second chapter is devoted to a little bit more specialized topic but very important for industrial information systems, viz. the identification of information needs. The stress is on the methodological side there and main tasks described are the following:

- categorization of information needs
- identification of groups of users
- carrying out of user studies

The next chapter deals also with methodology and the most important concepts of system evaluation are outlined there. It begins with stressing the point that information needs (how to assess them see chapter 2) form the ground against which information system can be evaluated. The methods of evaluating concern various activities e.g.

- referral
- bibliographic search
- document delivery

and various levels e.g.

- information center
- national information system

The fourth chapter contains definitions, short descriptions and examples of activities carried out in information systems, viz.

- generating
- collecting
- selecting
- analyzing
- annotating
- evaluating
- storing
- disseminating
- monitoring

The fifth chapter deals with methods of access to information sources. Different methods are described there depending on various categories of sources and on various levels of technological development. Conventional, computerized and network methods of access to information are discussed and the impact of technology on information system performance is emphasized.

The sixth chapter consists of two parts dealing with the categories of industrial and technological information (e.g. patent,

bibliographic, standards, technical reports, marketing etc.) and the forms of industrial information supply (e.g. information on information, SDI, retrospective search of information, data analysis etc.). In the second part the requirements for computer resources depending on form of supply and information category are described.

The next chapter is a kind of short tutorial on hardware, operational systems and software for information systems. This chapter may be skipped by the readers with some computer background except perhaps subchapters 7.2.4., 7.2.5 and 7.2.6 which contain some information relevant to computerized information system designer.

The eight chapter deals with the criteria and procedures of software selection. The main topics discussed are the following:

- groups of selection criteria
- procedures of selection
- tuning the software to the application
- software policy
- maintenance and development

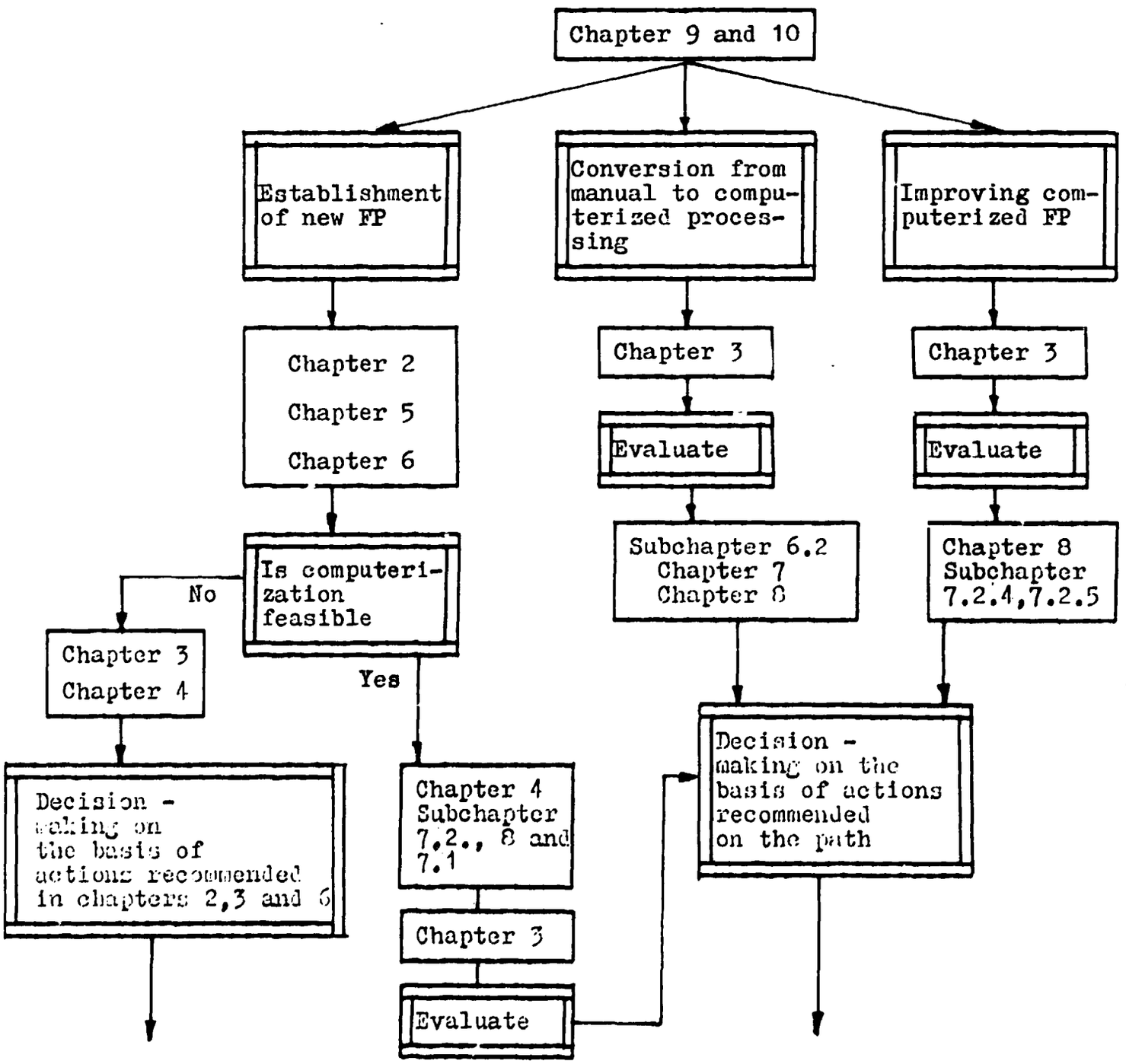
The ninth chapter contains - inter alia - the list of institutions which could be the partners of focal point and the list of functions to be performed by appropriate staff when medium-scale computerization is assumed. These lists should be checked when focal point is going to be established or redesigned (e.g. computerized processing is planned).

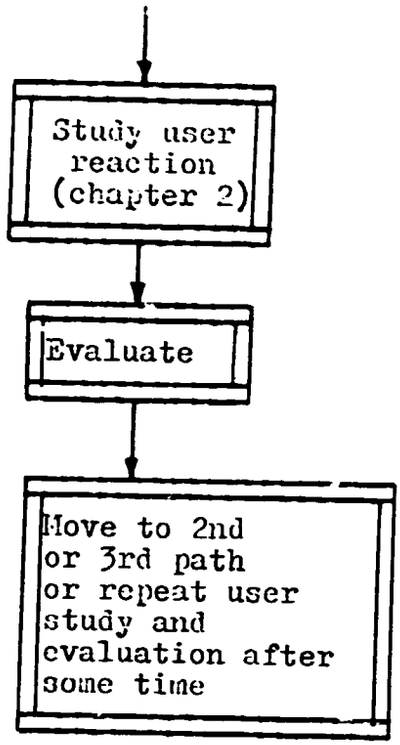
The last chapter deals with networking and as the discussion in the ninth chapter shows there is no need for building a vast computer network node at the focal point of a developing country (at least at the moment). Nevertheless, some partial solutions which can give functional effects similiar to that of computer network are proposed. The requirements for building a computer network are also briefly discussed in order to avoid incompatibility in the process

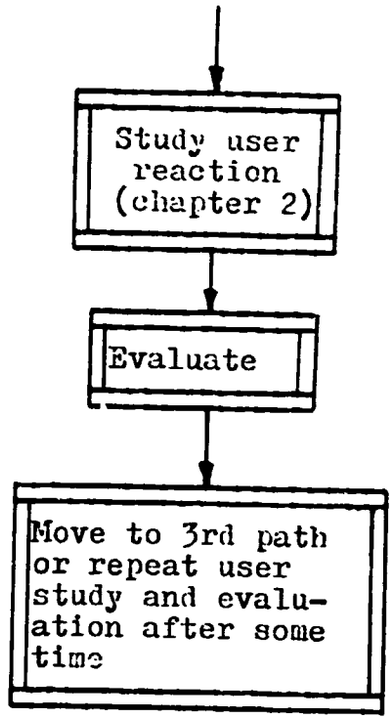
of stepwize refinement of industrial information system.

Ten appendices are referenced directly from the main text.

The bibliography is referenced through "live" references (e.g. [Battu,Rose]) and is ordered lexicographically by "live" reference. Readers with some information science background may skip some parts of the guidelines according to their professional expertise. The decision - makers in developing countries should in any case start reading from chapter 1. Then the suggested "path of reading" is the following:







The direct references in the text to specific subchapters should be, however, followed.

1. Concept formulation of industrial information system at national level

Industrial information service system, whatever will be (centralized, decentralized etc.) and whatever methods of operation it applies (conventional, computerized etc.) is to be developed within the general framework of the national information policy of each country.

It is up to the national government to determine where the industrial information system will be located and how it will operate.

Scientific and technical information is largely recognized as one of the national resources indispensable for the national socio-economic development. However the increasing volume of information and the growing cost of the processing and dissemination raised the problem of its proper management both by governmental bodies and by information specialists.

Improved information handling also has had a major impact on the dynamics of economic growth. In fact the economic growth of the richer countries is increasingly linked to the creation of technologies which process, store, transport and manipulate information. This in turn is bringing about substantial changes in the occupational structure of these countries. Although for the time being these tendencies are observed mainly in the North, they are striving to take hold in some of newly industrialised countries of Asia and Latin America.

Needless to say, the impact of all this on the institutions of developed countries dealing specifically with information (e.g. libraries, documentation centres) has been enormous. Accelerating developments in computing and communication technologies have, in a very short period of time, resulted in the creation of large

data bases and specialised small bibliographic and source data bases linked together within networks, with on-line access and document delivery systems to the users. Compatibility and unified methods of information handling became of prime importance in these schemes.

The information revolution has less to do with growth or volume of information recorded worldwide than with the fact that the new technology appears capable of de-institutionalising information and handling over access to the individual. More and more of the functions traditionally associated with the information intermediaries (such as libraries) can be performed by the end user himself. The public at large is becoming increasingly aware of the availability, importance and profitability of information for both personal and corporate use.

This is why the national governments are establishing their national policy for those who generate, process, disseminate and use scientific and technological information and establishing rules for its management and preservation for current and future needs of the entire society.

An information policy depends to a great extent on national socio-economic development plans and national priorities (rural development, industrial development, education, health etc). It also depends on country size, level of development and resources available.

There are many international and national guidelines for establishing and developing of a national information policy. [National Policy; Objectives Policy; National Policy USA]

All of these guidelines for a national information policy show that the formulation of such a policy is a complex and multifacets exercise involving not only information specialists but also and

foremost policy makers, administrators and managers of different national cultural, economic and social sectors. The nature of information is intersectorial and linked with different types of policies such as: international information policies, information technology policy, national science, cultural, foreign and even defense policy. All these policies are flexible and changing in time and therefore a national information policy should also be able to adjust itself to the changing environment.

Formulation of national information policy vary from country to country, but the main goals and aims are similar and focused on the following main issues:

- to ensure access to information and availability of publications,
- to ensure appropriate organization and management of national information systems and services,
- to promote an effective use of information,
- to ensure the current and future development of information systems and services.

To meet these goals - the governmental organizations responsible for implementation of information policy are formulating their objectives. They also vary from country to country - but the core of these objectives remain the same or it is very similar.

1.1. Access to information and availability of publications

1.1.1. Establishement of national bibliographic control

This objective aims to maintain at the national level a system of adequate recording of all published material the country collects (printed, audio-visual or otherwise) in order to facilitate storage and retrieval of information.

1.1.2. Improving the availability of publications

This implies planning and establishment of a national availability system, which should cater for present and potential demands.

It should be focused on main function of acquisition, supply and retention for future availability.

System should serve all kind of libraries and information systems. Each country must be able to supply its own imprints, No country, however can be self sufficient in information provision. A national system must incorporate mechanisms and procedures to direct requests to and from other countries. It also must ensure deposit and retention of publications for the needs of future generations.

1.1.3. Using modern information technology as means of access to information and availability of publications

The basic issue is whether information technology should be regarded as simply providing new and more effective tools for the implementation of information policies or it is itself a crucial factor affecting the formulation of information policies.
This question may be answered by saying that it should be both.
It is important to avoid a situation where policy formulation becomes technology driven. On the other hand, the enormous increase in information handling capability offered by some of new technologies (computer and telecommunication) greatly exceeds the limits of what is possible in attempting to meet the users needs and must certainly be taken into account when information policy is being formulated. The objective is to monitor technological development, to undertake a technological forecasting and to co-ordinate the supply of technological facilities for public services.

1.1.4. Generation of national information sources

This policy objective concentrates its attention on encouragement of national publishing industry to publish the results of national research and technology activity in local languages and to provide necessary subventions and/or legal facilities to them - and through this media improve access to local information sources, enrich the national intellectual heritage and contribute to better co-operation between information services and publishers.

1.2. Organization and management of information systems and services

1.2.1. Basic Information policy statement

The objective of formulation of national information policy is to be met by issuing of basic legislative act adopted by the parliament or other legislative body in which the national government recognizes its essential responsibilities in the information field, such as:

- provision of scientific and technical information,
- creation of national information resource (by developing services, systems and networks),
- recognition of information needs of society,
- access to published and unpublished but publicly available information sources,
- recognition of needs for national co-ordination of information activity,
- creation of appropriate national mechanisms for implementation of information policy and provision of necessary resources.

1.2.2. Establishment of a national mechanism for scientific and technical information

This implies to set up at ministerial level a national information policy or coordination body with the following basic responsibilities:

- formulation of national information policies,
- preparation of plans for the implementation of these policies,
- operational activities involved in the execution of these plans.

The principal functions of a national co-ordinating body are:

- review and analysis of existing information and manpower resources,
- creation or improvement of a national information system within the framework of the national overall and sectoral development plans,
- assistance to the system operation by providing appropriate legislation, financing, education and information technology,
- promotion of effective co-operation between all types of services within the national system,
- development of research and training programmes and facilities,
- stimulation of users awareness and assessment of users' needs,
- facilitation of the international exchange of information and international representation.

1.3. Promotion of an effective use of information

1.3.1. Users needs studies

No information activity can be effectively organized and developed without sufficient knowledge of its users, their needs and demands. Potential value of information is only known when it is

used. This objective aims at the identification of groups of users, the promotion of studies of users' needs in order to improve the national information activity and better serve users as well as to encourage an effective use of information on all societal levels.

This objective should take into account the facts that:

- information needs vary according to subject, service, users function and the extent to which users education has imparted knowledge of information sources and problems,
- the needs change with time and therefore should be kept under continuous review,
- it is important to distinguish between the information needs of the community served and the demands actually made on the service,
- personal liason between users and services is a means of distinguishing between real and apparent needs.

1.3.2. Evaluation of information systems and services

This objective implies to ensure the highest level of performance of national information system in the satisfaction of users' needs, through periodical analysis of existing information services and networks carrying out effectivness evaluation, cost effectivness or cost - benefit evaluation, aiming at more effective use of information.

1.4. Development of information systems and services

Information activity belongs to this sectors of national economy, which shows a systematic growth. This requires several nationwide policy action among which the following are of paramount importance:

1.4.1. Research and development

The objective here is to support other information activities with a programme of research in information science, aimed at solving problems of particular importance to national information system. Such research can include basic studies on storage, retrieval and communication of information relevant to national conditions as well as studies on users needs, economic studies, legal and administrative studies. It is an essential task of national policy to ensure that work of this kind is conducted systematically and that, in order to rationally spend the resources, the maximum use is made of research work done in other countries.

Only the larger developed countries can support a substantial programme of basic research in information.

1.4.2. Training and education of information specialists

The policy objective is to ensure an adequate supplies of suitable trained manpower for national information activity.

Apart from the supply of information material, the most important resource is manpower. No matter how generously physical and financial resources are provided, they can only effectively be used by adequate number of properly trained and qualified personnel. The range of skill required is wide and not confined to any one profession. It embraces the expertise of librarians, documentalists, telecommunication specialists, indexers, computer specialists and many others - in short - all who are involved in information transfer.

The national policy should assess two basic needs - to enable information specialists to secure initial qualifications and to make provision for refreshing, updating and extending knowledge in the field.

1.4.3. Formulation and implementation of national information policy

UNESCO - UNISIST guidlines suggests a step-by-step approach to implementation of national information policy. [Guidelines on National Information Policy]

The first step foresees to determine the overall framework for the project with the aim to identify the information fields to be covered.

The second step deals with the definition of the scope of the needed national information through assessment of information needs, designing of means to satisfy the information requirements and promoting of the effective use of information.

The third step concerns the formulation of a national information policy, namely: the preparation of a basic policy statement, establishment of a policy-making procedures and establishment of a policy making organization.

Step fourth deals with the implementation of the information policy, by setting up priorities among the various policy provisions for a better allocation of resources.

The last step is to develop a national co-ordinating organization in order to harmonize all the information activities and stimulate the development of information resources and services.

1.5. The role and place of national information systems and services for industry

As it has been said, a national information system for industry is a part of national information system for science and technology or, in another words, is a subsystem for industry and is up to the national information policy body to decide on its location within the national framework and of its mode of operation. The determinant factor for that location is the socio-economic situa-

tion of the country as well as a specific nature of industrial and technological information.

Information for industrial and technological development serves the needs of a variety of intermediate and end users. These encompass researches, technologists, managers, engineers, economists, administrators, sales managers and policy makers. The type of information they need is also of considerable variety. It includes bibliographical, factographical, numerical and full text information from published and nonpublished sources - concerning the whole spectrum of industrial activity starting with research, equipment, information on technologies - ending with environmental data and legislations.

Such information is originated in several national and international sources and needs to be permanently maintained and updated. Its transmition uses both formal and informal channels and a large variety of carriers. In addition it includes the provision of on-site expertise, advice at a distance as well as supply of documentary information.

Consequently an industrial and technological information system needs to have three main features:

a) a multidisciplinary outlook,

b) an ability to find its way arround the world of relevant knowledge, some of it propriatery, together with mastery of documentation, analysis and retrieval techniques,

c) a capacity to inspire confidence at whatever target level of end user.

It is important to contrast these features with the work of the information specialists who carry out a conventional information function, which is mostly concern with the down- flow of information from its original source where knowledge is stored, towards its

destination, where knowledge is demanded. The industrial and technological information system works in the reverse direction, upstream flows of information from needs relating to the specific purpose of optimizing industrial and technological development and operations to points where such needs can mostly likely be met. [Africa]

The industrial information needs both formal and informal channels. Informal discussion through person - to - person contact is the prefered channel for communication or transfer of information in industry. This is why the main source of information used by industry is the representative of suppliers, and he is used by small firms more than any other source. The quality of his information is unreliable, certainly sometimes biassed, yet he remains the preferred source of information.

Taking into account the above mentioned features - the national information system for industry must be combination of both - formal information and documentation services and - informal, extension service where the consulting activity is of an information officer is moved from the level of abstract development theories and documents to the level of practical interpretation and personal influence.

Therefore an industrial information service should be an operational unit which communicates information in documentary, oral or visual form to an industrial client as an input to a decision situation or for incorporation into a process, product, or operational activity.

What are the main functions to be fulfiled by an industrial information service: [Sweency]

- to provide decisions-makers in industry and their colleagues involved in acquiring and evaluating information with the informa-

tion essential to the introduction of technical change in order to improve competitivness of their processes and products and to enhance the quality and value added to their products,

- to provide this information in such a way that is specifically relevant to the unique problem of the user or client firm,
- to provide this information with the speed of response essential to his competitive environment,
- to achieve confidence in the organization through its credibility in responding to the real and changing needs of users,
- to provide intelligence and data on users and potential users, their needs and other characteristics in order that the services and products provided are needed and marketable and that new services or products can be defined and introduced,
- to provide the user firm with the communication network linking him to all sources of expertise required to neet his specific requirement when this occurs,
- to make the services easy of access through personal contact, making the organization a part of the social culture of the user,
- to make the service the one to which the user automatically turns when is need of an information input to solve a problem or meet a new challenge,
- to optimise cost-recovery activities through identification of clients in need of the particular services to products and to identify new services or products within the expertise and resources of the organization.

1.6. The establishment of a national industrial information system

The establishment of a new industrial national information system depends to, a great extent, on its objectives and functions.

If the functions are restricted to co-ordination or harmonisation of industrial information activity at the national level - the

mode and phasing of setting up such a body is similar to the national information policy body.

If, however, the functions of such a system are combined with operational information activity (storing, processing and dissiminating of industrial information) the following sequence of planning and implementation is to be applied. [Planning]

Preliminary phase

- Concept formulation (description of goals functions, responsibilities, mode of operation centralized or decentralized, links with national information system).
- Identification of needs (determining who and where are the users, their basic requirements and habits).
- Evaluation of existing activities (how the perceived needs are presently satisfied and why existing information activity not sufficient, that a new system should be established).
- Decision to establish the new system.
- Checking findings with potential users who should be aware of what is being planned and if possible to participate in system development.

Implementation phase

- Appointment of a system manager.
- Testing on a sample basis the input and output of the system and simulating some principal activities.
- Detailed system analysis (planning of the operational approach, decide on data acquisition and output options and consider all other aspects of system operation.
- Choice of software and hardware based on the results of system analysis.
- Pilot operation on a limited scale, which will permit the system manager to check the validity of the system analysis design and to harmonize and optimize its components.

- Scaling to full scope operation by expanding the results of pilot operation to the full scope and coverage of the system.
- Monitoring and evaluation of the ongoing activity and results achieved.

A considerable number of documents, which assist in the formulation of system concept, its implementation and operation are to be produced. All of them should be concise but comprehensive in order to facilitate appropriate decisions.

The following documents form the minimum project documentation:

- Concept definition document, containing the basic concepts and justifications for the establishment of a new industrial information system.
- Feasibility study - verifies the concept's feasibility of system implementation from technical, managerial and financial points of view.
- System analysis report describing the methods, procedures, time schedules, personal requirements, techniques etc. of the new system.
- Document on management structure, budget and control containing organizational charts, managerial responsibility, editing tasks, resource commitments, pricing policies etc.
- Description of hardware and software - selected for the system.
- Users manuals with precise instructions how to use and benefit from the system.
- Operating manuals - describing the tasks of system operators.
- Evaluation manual - for measuring the efficiency of the system.

1.7. Government responsibilities

Governments are responsible for the management of the physical and intellectual resources of their countries and for the former's optimal utilization.

They should give careful consideration to the fact that their natural resources are limited unlike the country's intellectual assets which are not limited to the same degree but are dependent on the strategy chosen for their development and use.

Governments should develop a long-term policy for the establishment of a co-ordinated national infrastructure of semi-autonomous institutes responsible for assessing, evaluating and applying technological information and using expertise relevant and appropriate to the natural resources of their own country.

National capabilities (i.e. the infrastructure of scientific and applied research institutes) should include, as a minimum, a focal point and a service mechanism designed to link up with similar mechanisms in other countries for the exchange of registered results of scientific and research operations. Advanced means such as telecommunications should be applied to serve the national infrastructure most effectively.

Taking into account that scientific information and research results only have value for the community when applied for practical purposes (i.e. improvements and innovations in enterprises), governments should establish a further mechanism, a country-wide network of technological information services with the aim and the responsibility of furthering the transfer, the application and the conversion of technological information into industrial enterprises (in particular the small and medium industries). Generally, these enterprises are neither aware of their needs, nor do they have the capacity to search for and acquire external relevant and appropriate information and expertise. [Klintøe]

2. Methods of identification of industrial information needs

The identification of industrial and technological information users needs could be named as a b a s i c guidance in the information system design, development and operation.

The industrial information needs depend on several factors such as: categories of users, production methods, types of equipment, type of product, size of a company (big, medium, small).

The most commonly required information cuts across technical, management and financial information in broad sense, but it could also include information relating to environment and socio-political data.

As it has been mentioned in previous chapter the industrial and technological needs are changing in time and it will be quite impossible and probably not useful to enumerate all categories of industrial information needs, which could be met in diversified industrial environment of developed and developing countries.

Such a catalogue of needs would be long and not exhaustive and with restricted practical value. The identification of needs must be done in concrete environment by appropriate users' needs study.

The basic concern of this chapter aims at presentation of m e t h o d s of identification, which could lead to their enumeration and cataloguing.

Furthermore the information needs also depend on level of development, socio-economic policy of the country, as well as on the world conjuncture. The needs of boom times are not the same as those of the recession.

The categorization of needs and identification of groups of users of industrial information used in this chapter should serve

only as indicative example which could help in the formulation and/or design of users' needs studies.

Having in view that these guidelines although design for formal information system would represent main interest to medium and small size enterprise - the example used in the guidelines are excerpt from literature dealing with these types of enterprises.

Some general guidance has been offered here only in order to have an overall orientation. Careful reading of appropriate reference work is nevertheless essential.

2.1. Categorization of industrial needs

The basic industrial information needs are closely linked with the main elements of the industrial process. [Klintøe]
(see also appendix No. 2)

To these categories the following should be cited:

- knowledge of the market. Within this category the enterprise should know - who are the clients, why they are buying this products and from this enterprise (design, quality, price etc). What will be their demand in the future and how many potential clients are there? Who are the competitors? What position we want to have in the market?

- design of the product

What is the demand of the market concerning the product design? (dimension and tolerance, its function, material). How will the use influence requests for maintainace and service?

- manufacturing of the product

Technologies to be applied. Their advantages and disadvantages (cost, productivity etc). Investment required. Expected results to the quality, production cost. Manpower requirement

(available or to be trained). Organization and plant lay-out.

- Quality control, Application of standards

- Marketing, selling and servicing the product

Organization of sales and services. Methods of promotion, distribution, transportation etc.

- Evaluation of achievements

Evaluation of productivity, costs and market effects. Competitivity and future development. Formulation of future strategies.

- Technological information for innovation and improvement

Possible sources of information, its relevance and quality. External and internal services. Organization of access, management and use of information.

Similar categorization of needs has been made by the British Library Research and Development Department after discussions with small business agencies. Specific problems although very diverse in their nature, tend to relate to topics common to many firms. [Small Firms] They can be grouped as follows:

Management

Obtaining information, counselling, consultancy, start up, administration, bookkeeping, management training, computers, government policies, miscellaneous factors.

Products

Research, innovation, design, development, testing, quality control, standards, regulations, patents, technical information, product diversification, costing.

Production

Plant, process, control, automation, maintenance, tracing, suppliers, sub-contractors, distribution.

Finance

Finding sources, grants, loans, banks, accountants, cash flow, payment delays, financial management.

Markets

Market research, new orders, contracts, tenders, competition, advertising, promotion, selling, exhibitions, shows, exporting, export documentation, tracing firms, agents, market diversification.

Premises

Finding, relocating, expansion, planning, financing, building, controls, construction.

Employment

Recruitment, training, wage rates, National Insurance, legislation, unions.

Legislation

Tax, VAT, health and safety regulations, form-filling etc.

2.2. Identification of groups of users

The key to successful information system design is, without any doubts, the correct identification of users groups.

Any information centre, including industrial information, can only be successful if it has identified adequatly users and their needs, as well as adequatly defined the groups of users which it does not intend to serve.

The first approach to group the users is usually done accordingly to some major characteristics.

In the case of industrial activity the first groupment could be developed by main functions, for example:

- Policy makers,
- Administrators (managers),

- Researches,
- Development engineers,
- Factory supervisors,
- Sales managers,
- Workers (practicioners)

Policy makers - being concerned with allocation of resources and basic decisions - will require digests of statistics and concise information concerning production, market and forecast.

The industrial information need will be the evaluation one.

Administrators (managers) are in charge to convert the policy decisions into practice. Their position requires prescriptive information dealing with whole manufacturing process and its organization.

Researchers - require information on basic and applied research in given field, mainly information on ongoing and accomplished research.

The type of information needed is innovative.

Development engineers - need information on view technologies, equipment and new materials. The type of information will be mainly descriptive.

Factory supervisors, involved in organization and management of the company, require broad spectrum of information dealing with technological, managerial, financial and legal information.

Sales managers need information on market situation, clientele, competitivity of the product or service. The type of such information could be named commercial.

Workers and other practicionners require practical and instructive information.

Having identified the group of information users and their general fields of interests - the next step should be taken namely

- identification their specific needs in more detailed way, taking also into account their habits of information use.

Identification of general information needs as well as general studies of users needs at the national level cannot be a sufficient guide on how to satisfy the requirements of specific group of users at branch or at company level.

For that type of needs it is necessary to conduct particular studies in a concrete industrial environment.

2.3. Methods of identification of needs

The choice of methods of data collection must be very carefully considered both to the type of data and to the people whose needs are being surveyed. For example the information needs of workers or cottage industry people could not be investigated by sending them a detailed questionnaire. An interview as a method of collecting data will be more appropriate in this case.

Before defining the objectives of surveys and starting the collection of data - it is important to study the information environment of the factory or industry branch as well as the main streams of information flows. Such a study could avoid any misunderstanding and risk of obtaining inadequate data through asking the wrong questions to the users group being studied.

Information flow is a complex subject and there are many interlinked factors which affect it, such as: - educational background of the user, - language, - information technology etc.

Knowledge of all these factors will facilitate the definition of methods and execution of users needs studies.

2.4. Defining the objective

Any design of users study should take into account - the objectives of the study, - the population (users) to be studied, and

- the resources available for the study.

The definition of objectives involves three interrelated stages.

The first - is the precise definition of the purpose. The purpose for example could be:

- to develop a predictive model of information use behavior,
- to assess the probable effects of changes in information provision,
- to investigate the effectiveness of use of existing information channels,
- to determine the most valuable information sources.

The second stage is to define the specific topics that relate to those objectives. If an objective is to determine the usefulness of information channels - the related topics could be:

- formal channels (information services)
- informal channels (people-to-people information exchange)
- conventional methods
- modern information technology - and so on.

The third step is to complete a list of data required for each topic (see example of questionnaire in appendix 1).

Definition of a user group to be studied is also an essential element of the survey objective. It should be clearly defined - if the study should embrace only a concrete group of people (e.g. factory engineers) or all information users in a company or industry branch. The formulation of data to be collected depends to a great extent on the group of users to be surveyed.

The resources needed to undertake a users needs study should be defined at the very early stage. It is linked with the time table of the study, number of population, the method used (postal questionnaire and/or interview) the staff needed and the overhead expenses (postal tariffs etc).

Each survey requires a budget and staff adapted to its own conditions.

2.5. Methods of data collection

This chapter describes in a general terms the various methods of data collection.

There are four main methods of obtaining data about information users:

- documentary sources,
- diaries,
- questionning (interview),
- observation.

The data collection technique is selected by specifying the type of data needed to meet the study objective, considering the available methods which might provide these data and choosing the most appropriate one.

There are many documentary sources which might be used for data collection. Usually the investigator starts his study by examining existing records of use of library or information service (e.g. analysis of number and subject of books and journals borrowed by each category of users).

Another source is the record of inter-library loans transactions - both for journals and monographs, or so called, failure surveys - recording the details of nonsatisfying of users needs.

The investigator also might use a citation analysis - mainly for scientists or researchers needs, in given, well specified, field.

The diary method of collecting data about users access to information sources is one of the oldest, but in practice very difficult to be realized. It requires an systematic selfobservation which can be done either in written or in tape-recorded form. The recorded

items are the events which are the object of the study.

This method is rather applied to users in the field of research and education as well as administration - but not in the industry, where it is difficult to find volunteers for such a registry among engineers or production managers.

The questionning method could be realized either by a questionnaire (indirect method) or by interview (direct method).

The questions posed can be open-ended or closed, that means - in the first case the respondent can answer in his own words in the second - the answer is predetermined.

For designing a questionnaire - a standard questionnaire, largely represented in the literature, can be used. However the investigator should adopt such a questionnaire to the specific area of inquiry and in many cases to add new or to delete irrelevant questions. The standard questionnaire usually take the form of a skeleton (see specimen questionnaire in appendix 1).

The standard questionnaire can also be built in the form of modules to his particular objectives and situations.

Another form of questioning is an interview, which can be unstructured or semi-structured.

This techniques is very valuable for users needs studies in the industry. It can be done indicidually, or by group interview, but the group should be relatively small (not more than ten people) and the interview must be held in surroundings which are familiar to the participant (e.g. with a group of manual workers a room in a factory is suitable).

For short interview a telephone questionning can sometimes be used.

One general observation - the subject matter of surveys can be of a delicate nature. Therefore a complete anonimity of respondents

is required.

Systematic observation is one of the data collection methods which can play an important role in users needs research. However if observation is made of an individual respondent (use of information sources etc) the method is highly time-consuming and can only be used in small - scale intensive studies.

As an integral part of the questionning process, observation has a very valuable role to play, but requires a prior plan of data to be gathered and a structural observation guide - that is a list of items and events on which data is required.

Sampling

Whatever data collection methid is selected the question of choosing a representative sample on whom data should be collected and analysed will arise unless one is in a position to cover the entire population of users under consideration.

There are several methods of sampling, and an appropriate reference work should be consulted to determine the size of the sample needed to get an acceptably small sampling error.

One of the simplest methods of sampling is the "convenience" sample. Here the investigator contacts the users which are easy to reach. Unfortunately the users sellected in that way will probably not be representative.

The unbiased sample, which is called a probability sample is more representative.

In this method users will be selected completly at random from the entire population so each user has an equal chance of being part of the sample. For this purpose a current list of users should be used in which the investigator takes for example every 10-th or 15-th name so as to obtain a reasonable sample.

In practice the sample size often dictated by practical consideration such as resources or staff availability.

2.6. Survey report

The survey report usually contains two kind of reports:

- one general report with description of the general results findings, and
- a technical report, dealing mainly with technical, statistical aspects of the sampling design, execution of the survey and analysis.

The general report should include information on the following points:

- statement of purpose of the survey,
- description of the converage,
- collection of information (nature of information),
- numerical results,
- date and duration,
- accuracy attained,
- costs,
- assessement of purpose,
- names of sponsors and investigators.

The technical report covers all special aspects of the survey such as:

- specification of the frame (geographic areas etc),
- design of the survey,
- staff and equipment used,
- statistical analysis and computational procedures,
- accuracy of the survey,
- costing analysis,
- efficiency,

The details of specification and form of presentation will vary with each survey - depending on the experience of the investigator in report writing and presentation of numerical data. A proper balance should be made between statistical tables and their verbal summary in order to make the survey report easier to understand.

3. Methods of evaluation of existing information activities and their improvement

Evaluation is a process of analysis and control designed to determine the relevance, effectiveness, and impact of specific activities and the degree of efficiency with which they are carried out, with reference to the immediate objective for which they were designed and planned and within the wider frame of reference of the more comprehensive, often longer term, development objectives of the programme of which a project or a group of projects form part.

Evaluation is complementary to other control functions such as monitoring, auditing and inspection. Its principal objective is to identify the relative efficiency and effectiveness of alternative approaches to development and the level of significance of specific activities in the process of change.

Evaluation may be carried out as an ongoing activity in the course of project or programme implementation, as an ad hoc intervention, or as a project assessment of efficiency, effectiveness, replicability and expansion capacity.

Finally, it may also be designed as an ex-post evaluation. [Grabe]

3.1. Basic information needs - a prerequisite for an evaluation of an information service

The principal information needs and demands of user of information services fall into two broad categories: [Evaluation]

- the need to locate and obtain a copy of a particular document for which author and/or title are known,
- the need to locate documents dealing with a particular subject.

These needs of which the first is named known item need and the second - subject need could also be grouped from the point of view of users' demands *) in following way:

- the need for "referral information" to answer a question "where I can find information, publication or data on a given subject", i.e. service designed to refer users to appropriate source of information - personal or institutional,
- the need for bibliographical reference information which could be a current awareness need, or need for retrospective search,
- the need for documents delivery.

3.2. Evaluation of referral activity [Evaluation]

The key functions of a referral service, which may be regarded as a specific form of a reference service of the library or information centre, are the following: obtaining information from the user, identifying relevant source of information, formulating the response, communicating the response to the user.

The evaluation process of a reference service could be done by measuring the results of the work against a set of criteria.

What will be measured?

- Appropriateness and validity - answering the question "Did you find the service helpful"? (user satisfaction) "In what way did the service help you"?

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*) A distinction should be made between "needs" and "demands". The needs can be assumed to be more numerous than the demands (expressed needs) because not all information needs will be converted into demands evaluation.

- Interpretability - formulation of the results of measurement to be communicated to staff or founders e.g. we are able to complete 80% of our reference transaction by day,
- Controllability - control to what extend the material that is circulated is used (demand for future service),
- Comparability - to compare the results with those of other centres or libraries,
- Informativeness - to test wheter the proposed measure will provide information for a decision,
- Practicality - whether the proposed measures is affordable in terms of money, time and effort required to produce the results?
- Timeless and feedback - for example for documents availability,
- Accuracy and reliability - (trustworthiness of the data produced),
- Representativeness (selecting right period for measurement e.g. not a vacation period),
- Precision required - (to agree on practical rate of precision).

The criteria by which a reference service can be evaluated are the following:

- off all the question submitted to an information service, what proportion does the staff of the service attempt to answer?
- for what proportion of the questions attempted is an answer found?
- what proportion of all answers supplied are complete and correct?

The evaluation of reference service can be approached in two different ways. Both methods involve the compilation of a representative set of questions of the type normally handled by the service to be evaluated, for which the asnwer is already known. The evaluation as such can be done by an <u>obtrusive</u> study or by <u>unobtrusive</u> test.

In the <u>obtrusive</u> study the information specialist of the evalua-

They are asked to find the answers - and are timed. They are scored on the basis of the number of correct answers found and the amount of time taken to arrive at the answer.

The unobtrusive test of reference question performance is similar to the obtrusive test in that, that requires the compilation of a set of questions, for which the correct answers are known by the investigators. The questions are then put to the information service as though they were questions representing information needs of real users. The unobtrusive technique is more successful - and it could be used for the comparative evaluation of similar information centres.

3.3. Evaluation of bibliographic (literature) searching [Evaluation]

Literature searching means any activity in which a search of the literature is conducted to find bibliographic material on a given subject. The search can be performed in a conventional manner (manual) or via computer - for data stored in machine readable form.

The basic qualitative evaluation criteria for literature searching are the following:

- Coverage,
- Recall,
- Precision,
- Novelty,

Coverage - is a measure for completeness of a collection of data base.

Recall refers to a measure of whether or not a particular item is retrieved or the extend to which the retrieval of wanted material occurs. In the comprehensive search of a data base, we can measure the success of the search in terms of the extent to which all the relevant documents are retrieved. This measure is frequently refered to as a recall ratio.

Precision is a measure of signal-to-noise in information system, A literature search that retrieves fifty documents of which ten are judged relevant by the user, operated at precision ration 10/50.

Novelty refers to the newness of information supplied by a service and is at obvious importance in the evaluation of current awareness services.

To the basic qualitative criteria the cost and time should be added. All of the public services of an information centre must be evaluated according to time, cost and quality criteria.

3.4. Evaluation of documents delivery [Evaluation]

The documents delivery service is evaluated on the basis on whether or not the service can supply the document at time it is needed.

Three possible facets of evaluation are implied in the document delivery analysis

- evaluation of the collection of the centre,
- evaluation of the catalogue,
- evaluation of the document availability.

From the users point of view - the most important is the evaluation of the document availability.

There are two possible approaches to the evaluation of the availability of an information centre the documents needed by users:

- the construction of a representative citation pool, and the application of this to a centre to determine - what proportion of documents are owned and - how readily available this documents are,
- the selection of a period of time within which the actual demands of users are monitored and the success note in document delivery is measured.

The first approach could be done by a document delivery test,

results of which could answer - what proportion of the documents in the test is covered by the centre (coverage study) and determining how accessible these items are at the time the test is administered.

The second approach involves an attempt to determine what demands are placed on a collection in a specified period of time, what proportion of these are satisfied, and what are the major factors that determine whether or not documents are available at the time needed.

Whatever type of documents delivery test is used, the most important part of the evaluation will be the analysis of the reasons of failures.

3.5. Levels of evaluation

There are three possible levels at which an evaluation service can be carried out:

- effectiveness evaluation,
- cost-effectieness evaluation,
- cost-benefit evaluation.

An evaluation of <u>effectiveness</u> is an evaluation of users satisfaction. Such an evaluation should determine how well an information service satisfies the needs of its users, but frequently this type of evaluation is restricted only to a consideration of how well the service meets the demands of users.

There are two further level of evaluation of effectiveness - macroevaluation, which responses to the question how the service performs <u>now</u> but not how to improve it in the future, and - microevaluation, which determines why the system performs at the present level and what may be done to increase the performance level in the future.

A cost - effectiveness evaluation relates to measures of effectiveness to costs and determines which of methods should be used to obtain the best results at minimum cost.

A cost - benefit analysis attempts to relate the costs of providing some services to the benefits of having this services available.

In public information services the two first levels of evaluation are used - the first qualitative, analysing the level of satisfaction of the users and the second - comparing costs to quality of services - trying reduce the expenses and preserve or even improve the level of performance. The cost benefit analysis is practically not used in public information evaluation.

Evaluation whatever it is must be seen as a critical activity. It seeks to establish, as systematically and objectively as possible, what is efficient, effective and relevant and what is not in objectives choice of methods, planning, inputs and implementation.

It determines the value of what has been done in terms of effects and impact to intended effects and impact. Its essential purpose is to advance the state of the art, to improve knowledge of how in different identyfiable conditions, development may be achieved in line with general policy and objectives. [Evaluation]

3.6. Evaluation steps

Evaluation of an operating information service should not be considered as merely a one-time activity. The performance of information services should be monitored continously. It involves several steps, which could be described as follows:

- Defining the scope of evaluation,
- Defining the evaluation programme,
- Execution of the evaluation,

- Analysis and interpretation of the results,
- Modifying the service or system on the basis of evaluation results.

Definition of scope should in all cases begin with a review of the objectives of the service to be evaluated and entails the preparation of precise set of questions that the evaluation must be designed to answer. The definition of scope should be prepared by the person requesting the evaluation (manager, sponsor, funding agency).

Evaluation programme - is aplan of action that will allow gathering of data needed to answer the question posed in the definition of scope. Usually the data to be needed to answer each question and procedures which could be used to gather these data, should be identified.

Execution of evaluation is the stage at which the data are gathered. This data could be collected from a wide variety of sources and using different methods of data collection and processing.

Analysis and interpretation of results is the next step of evaluation in which the evaluator will discover the strong points of the system as well its failures or weaknesses and limitations. The final element in this phase is preparation of a report and recommendation as to the system improvement.

The final stage of the evaluation is the implementation of the recommendations approved by the system manager or his/her supervisors.

3.7. Evaluation of a national information system

A national information system usually embraces a number of centres and services, each with a special role to play in the provision of information such as bibliographic search, referral service, document delivery etc.

The effectiveness of each of the component in such a national system can be evaluated according to the criteria applied to the single service. It should be mentioned however that the complete system can be regarded as more than the sum of the evaluation of its components parts. The interrelationship existing among these parts will also be important. An assessment of the internal efficiency of the complete system must consider not only the efficiency of the individual components, but also the functional interdependence of these components (e.g. compatibility, common communication format, common standards etc).

4. Ways and means of generating, collecting, selecting, analysing, anotating, evaluating, storing, disseminating and monitoring the needed information to the users

This chapter aims to review briefly the information handling procedures of formal industrial information systems and to provide concise information on the main operations of the information transfer chain.

This review has an indicative character and could serve as a general introduction or guidance. For more details it is necessary to consult the reference works cited in the bibliography.

The basic types of industrial information sources are described in chapter 5, where a general characteristic of types of sources relevant to industrial needs has been given and the main providers of such information are mentioned.

4.1. Types of documents

There exists a great variety of documents, which could be described from different points of view. The first general approach is to classify documents from their physical nature. Here a distinction could be made between textual and non-textual documents.

The first category contains the written documents - or a written text to be read, for example - books, periodicals, technical catalogues, patents etc.

The second category comprises non-textual documents in which information is presented in their essential part in other form than textual, however, some information can contain a textual information, for example:

- Iconic documents: images, maps, plans, graphs, diagrams, photographs etc.
- Sound documents: sound records, tapes

- Audio-visual documents: films, video-tapes, discs
- Magnetic documents: data base tapes etc.

The documents can also be considered from the intellectual point of view - to define their value, interest and mode of utilization.

Here a distinction is to be made between primary, secondary and tertiary documents.

Primary documents are the originals prepared by the individual or corporate authors (monographs, articles in the periodicals etc). They could be considered from the point of view of content (subject matter, level of presentation etc) or of purpose (teaching, advertising etc).

Secondary documents are documents which refer to primary documents and will not exist without them; they describe primary documents in the form of bibliographies, indexes, catalogues etc.

Tertiary documents are based on primary and secondary documents. They consolidate the original information, condense it and present in the form of review, state-of-the-art reports etc.

The mode of presentation and the structure of the documents depends on the type and usually contains information which is sufficient for its identification and processing, such as title, author's name, editor, place and date of issuing (for monographs) - title, volume and issue number, date, titles of articles and names of authors etc. (for serials).

Some problems could arrise with the identification of non-published, documents (manuscripts) and non-textual documents in which sometimes the important indications such as author or date of issuing are omitted.

The information center or the library uses the national standards for identifying documents (if they exist) or work out its own rules in order to process the documents incorporated in their collections.[Guinchat]

(A list containing definitions of the main types of documents is included in the appendix 6)

4.2. Provision of documents, selection and acquisition

Whatever national industrial information system is established (centralized or decentralized) it must perform certain basic operations. It is not the intention here to give detailed description of the various procedures, but simply to note them in outline.

No widely applicable prescription for coverage of documents to be provided can be given, since circumstances and values vary so much from one country to another. Principles of selection will be determined in the first instance by the need to meet the shared objectives, particularly in the terms of satisfaction rate and must therefore be influenced by the nature of demand, since satisfaction rate is by definition the degree to which a system can satisfy demand.

In general the national industrial information system should aim to be able to provide all national published and non-published documents relevant to the industrial needs - and sufficient foreign documents to meet an economic proportion of demand. A number of criteria may be applied than such as: volume of demand, speed of occurs, cost of publication, which can specify coverage in greater detail.

The acquisition of <u>national imprints</u> is made based chiefly on bibliographies prepared both by libraries and book trade which stimulate demand and aid in purchase of publication.

An alternative to such an individual selection, which is very time-consuming and relies largely on bibliographies which may have poor currency, is the use of agents to supply all publications within given parameters of subject, form, level, date of publication, etc.

Supply of foreign publications is made usually by purchase and exchange.

Selection and acquisition may be done individually by item, though this is slow and dependent for quality on the selector's judgement; in response to demand, which introduces delays; or by blanket order if particular categories can be identified and resources permit. [Vickers]

4.3. Processing of documents, bibliographic record and description, classification, indexing

Once acquired, the documents must be processed for addition to stock. The receipt of serial issues must be recorded and identifying shelfmarks allocated. Monographic material must be catalogued and possibly classified. All material has to be shelved.

The extent of cataloguing and the need to classify stock will depend upon the nature of the institution. A control service on closed access would not necessarily have to apply the same level of cataloguing as would an institution open to users, depending on whether its catalogues was available (esp. on-line) for external users.

In a system that relies on the cooperation of a number of institutions linked by union catalogue entries will have to be prepared for, sent to and amalgamated by the institution housing the union catalogue.

Each library should undertake responsibility for preparing the comprehensive bibliographic records of its acquired documents and in so doing follow international cataloguing principles and adopt international bibliographic standards, specifically the International Standard Bibliographic Descriptions (ISBD's); and international numbering system such as the International Standard Book Number (ISBN) or the International Standard Serial Number (ISSN); and

also should adopt an internationally used classification scheme for the records.

Bibliographic record is usually made up of information about the publication taken directly from the publication (bibliographic description).

The making of bibliographic records, the intellectual process of cataloguing the publication by hand, takes place in every organization, large or small, wherever materials of information content are collected and organized systematically in order to serve the educational, research or practical needs of users.

Rules and manuals of practice for the preparation of bibliographic records are required in all organizations which provide information.

Most cataloguing rules are collected and published as codes of practice, and are national or local in origin and use, drawn up to meet the particular requirements of a language or publishing tradition.

Bibliographic description is made up of these elements which are taken from the publication in hand.

The International Standard Bibliographic Description (ISBD's) is a set of normative documents for the comprehensive standard bibliographic description for all types of material likely to appear in library collections, which have been developed and accepted internationally. The General ISBD (ISBD (G)) forms the basis of the specialized ISBD's and of rules for description in new cataloguing codes. [Manual] (see appendix 7)

If the collection of documents is to be operate efficiently as an information tool, the bibliographic record of the publication should include on indication of its subject content, and the cumulation of records in the printed [illegible]es are most usefully arranged in accordance with some system of classification. (see appendix 8)

The international information community, while fully appreciative of the advantages of a classified arrangement for the printed issues, do not believe that it is possible to recommend any one scheme. [National Bibliographies]

The recommendation made by this community stated that the current issues of the printed bibliographies should be arranged accordingly with a internationally - used classification scheme. The difficulty is to find such an acceptable scheme.

The Library of Congress schedules is such a scheme, which has wide acceptance in North America and in academic libraries in other parts of the world but not in Europe.

Dewey Decimal Classification (DDC) scheme similarly has had a wide acceptance in North America - but not in Europe.

For this purpose Universal Decimal Classification (UDC) with its wide acceptance in Europe might seem to be the best scheme. [UDC]

Indexing is another form of content description involving selection of the most appropriate terms to represent the content of a document. These terms are taken from the vocabulary of the documentary language and are ordered to facilitate construction of the files to be used in searching.

The aim of indexing is to answer the question the user might ask about the purpose of a document and how it can help him.
These can be memorized under the following general headings: subject (covered by the document); approach (the way the subject is presented); manner (clarify the context of the action); time (date or period of the action); place (location of the action).

There are three main levels of indexing:

- generic indexing - covering only the main subjects of the documents; medium - level indexing, which covers all the subjects treated in the document but identifies them by means of relatively general terms; and in - depth indexing, which takes all sub-

jects and describes them precisely.

The products of indexing are indexed - i.e. lists of significant terms. They may be contained in the primary document, usually at the end, or printed in current secondary publications. They can also be incorporated into manual or machine-readable files with a view to selecting documents according to the subject with which they deal. In either case index serve to select and retrieve information for the benefit of the users.

4.4. Contents description - abstracting

Contents description is an operation which describes the subject matter of a document and creates a new products which accompany the primary document such as: classification, indexing or abstracting. Contents description is undertaken because the original document is to voluminous, and because the author and the user often do not employ the same vocabulary with the same meaning, and because an information system can only work properly when the formulation of user queries coincides with its representation of the content of the documents.

The contents description has in view: to inform the user on the subject of the document, - to facilitate the decision on document's storing and preservation and - to provide adequate elements for documents retrieval.

Contents description must possess several qualities:

- it must be as true and complete a representation of the document as possible;
- it must be as precise and accurate as possible;
- it must be stable and uniform;
- it must be neutral or objective and correctly reflect the documents content.

The most common form of contents description, besides of classification and indexing, describe above, is abstracting.

Abstracts, which may be produced by the author, by publisher or by information specialist, usually take the form of quite short texts either accompanying the original document or included in the secondary journals.

Abstracting is an operation which reduces considerably the volume of primary information and lays emphasis on aspects of primary importance to the user.

Abstracting, similarily to other forms of contents description, serves three main functions:

- selection of information by the user; - retrieval of information, especially by the computerized systems, and - dissemination of information.

There are two main types of abstracts - indicative abstracts, which provide a short summary of the content of the document and - informative abstracts, which include a number of elements of interest to the user. (see appendix 9)

The main contents of an abstract consists of a synthesis of the primary document and indicates: - the subject of the document; - the nature of the document; - the aims of the work described; - the methods or type of methods employed; - the results obtained; - the author conclusions; - the date and place of the work; - an indication as to the relative importance of the document (in the case of a critical abstract). [ISO]

An abstract, like any other product of content, analysis, should possess several qualities:

- it should be concise and precise; it should be complete in itself, fully understandable and not require reference to any other document and finaly must be objective and free of the personal judgement of the abstracter.

4.5. Storage of documents

Storage is the operation serving the best possible preservation, utilization and retention of documents; in another words, storage serves the establishment of a collection of documents, which could be used for research, teaching, production and any other purpose.

There are three basic forms of storage of documents:

- in their original form; - in reduced form or microform (microfilm, microfiche, microcard);
- in digital form (magnetic tapes, videodiscs, optical discs).

Each of the three forms of storage has its advantages and disadvantages. Storage of documents in their original form is most appropriate to the user but needs lot of space and conservation of publications. Microform saves considerable space and weight, but this technique requires special reading and reproduction devices. Optical disc technology provides the ability to store large quantities of information in a relatively small amount of space and to retrieve and display documents almost instantaneously, but also needs a special equipment.

The stored documents, independently of their physical form should be collected in a predeterminated filing system. Filing consist in arrenging the documents in such an order so that they can be easily and rapidly retrieved, when requested. The proper use of the collection depends on a good filing system, which should be easy and quick to use, assign the document to one and only one place, which never changes, be capable of expension, allow the detection of shelving errors, and ensure the satisfactory conservation of documents.

There are two main types of filing: numerical and systematic filing.

In numerical filing the documents are arranged in order of acquisition, by their accession number. The advantages are simplicity, infinite extensibility and the saving of space. The main disadvantage is that subject and authors are scattered and one has to look through author and for subject catalogue to locate a document or find out what the information unit has on a particular subject.

In systematic filing, the documents are arranged according to their subjects and in conformity with a predeterminated classification. Within each class, the documents are usually placed in alphabetical order. This method has the advantage of grouping documents on a particular subject and facilitating direct access to the shelves. The main drawback in that filing is that the space is not efficiently used and that works with not well defined subject can be difficult to retrieve. [Guinchat]

The catalogues and files are the tools, which facilitate access to the collection of documents. Usually a catalogue is an ordered set of bibliographic records stored in a library or an institution.

There are various types of catalogues, which can be distinguished according to the method of handling, the nature of the carrier employed, and the method of arrangement.

According to the methods of handling one can divide the catalogues as:

- manual catalogues, consisting of conventional cataloguing, cards or loose-leaves,
- semi-mechanized catalogues - which are made out on special cards and require special equipment for recording and retrieval (e.g. punched cards),
- computerized catalogues (machine readable files) recorded in digital form on magnetic tapes or discs and processed by a computer.

The catalogues can also be divided according to the nature of the carrier such as cards catalogues, printed catalogues, machine readable carriers, microform catalogues.

The most common ordering of catalogues is according to the method of arrangement namely an author catalogue and a subject catalogue. There are other types of catalogue such as topographical, chronological, geographical, by type of documents etc. but the first two are the most frequent in use.

4.6. Information retrieval

Retrieval is the operation by which items are selected from a collection, not only a library catalogue, but also any index or bibliography. The process of retrieval takes place repeatedly in every search for information.

The retrieval process is closely linked with the search purpose, which could be for example:

- to clarify the subject of search,
- to find an introduction to a subject,
- to get references to articles on the subject.

The point of entry for information retrieval is a list of words - index entries, a table of contents, and so on. These may be linked to the document identifiers (references) directly or via code (classification symbol). The identifier may include, or be linked to, a statement of the location or address of the document.

In the whole operation of retrieval we can distinguish four phases:

- word retrieval - in which we identify the words that will adequately describe the information sought,
- reference retrieval - in which we identify references that are probably pertinent to the inquiry;
- document retrieval - in which these documents are located; and

- data retrieval, in which the sought information is extracted.

[Atherton]

There are many retrieval systems which handle one or more phases of the total operation using one of the existing types of information retrieval, such as:

- retrieval by means of a catalogue card file,
- retrieval by means of an index or printed catalogue,
- retrieval by means of a dictionary index,
- retrieval by means of an optical coincidence file,
- retrieval by a computer.

Computer - retrieval procedures have been used by many organizations for file searching. In most cases, each file item is represented by a single record which contains a coded representation of the subject analysis of that item. The usual practice is to pass the entire file through the computer in order to select items of interest. It is also possible to divide the file into subsections so that only a portion of the entire file has to be examined. This has the advantage of requiring less machine time.

The computer retrieval procedures have to be adopted to the specific characteristics of the equipment used. The approach will also depend on wheter the computer is used on a fixed-time allocation or on direct access, for batch processing or on-line, and whether the information centre employs its own data base or of a computerized network or wheter the task is concerned with retrospective search or the selective dissemination of information, with producing a bibliographic list or the answer to a specific query.

The computer retrieval procedures also depend on whether the file employed is sequential or inverted on whether or not the system is interactive.

Retrieval with a sequential file requires to read the whole file to carry out the search, since records are arranged in order of accession number. The records are extracted from sequential file transcribed on a working file and sorted for printing.

In the case of retrieval with an inverted file - the search keys in the queries are compared with those which have been entered in the inverted file from the bibliographic records registered on a separate file.

The numbers of the documents corresponding to each key are placed on a working file which is then utilized to carry our the logical operations specified by the search formula. Having found the numbers of the documents selected it is possible to turn to the bibliographic file and extract the records which will be passed on to the user. (see appendix 10)

Interactive retrieval takes place on-line usually through a visual-display terminal.

The user asks to be connected to the computer system and relevant data-base, then he utilizes his selected search keys and the system indicates the number of records which are in the data base. After an operation of selection the user can have the corresponding records displayed and printed out.

4.7. Dissemination of information

The dissemination of information is usually the final phase of information transfer chain and ends the processing of documents and information. It consists of the documents supply to the user or of ensuring their availability in other form.

Dissemination can involve: the primary document in original form or as a copy, (document supply);

- the reference to the document - (secondary information product - usually bibliographic reference service); information or data contained in the document (information supply) or reference to the

sources of information (referral service).

Dissemination of primary documents is organized in various ways. The conventional way is the on-line consultation of the user in the information unit either directly or through librarian or information specialist.

Another possibility is the loans of documents. User can take home a number of documents for a certain period of time. If the required documents are not available in the library - it can be borrowed from another library on behalf of the user.

Finaly the user can purchase the requested documents (subscription for serials, permanent acquisition for other types of documents) in their original form or photocopies, microforms, or in machine-readable form (off or on-line access to textual data bases).

The dissemination of secondary information products depends on the content, periodicity, presentation and objectives.

The most common way is the current awareness service - periodical publication in which the acquired are reviewed immediately upon receipt and brought to the attention of those persons to whose work they are related.

Another forms are lists of acquisition informing users in periodic intervals on new acquisitions, or current contents which reproduce the content pages of periodicals usually selected by subjects.

More comprehensive form of dissemination of secondary information are bibliographic bulletins or abstracting journals providing on regular basis bibliographic description of documents. The majority of them contain abstracts and are organized systematically by subject categories and often divided into parts published separately. (Referativnyj Zhurnal, Bulletin signaletique)

The information (data) supply through tertiary documents is an another form of dissemination of information, mainly in science and

technology.

It consists of evaluation of data or of consolidation of information in given field, or of simple data extraction.

Such information is published and dissemination to the users in the form of reviews, state-of-the-act reports, tables or synthesis. It is very appreciated by the specialists because provides condense information on the subject and represents generally information of high quality.

Specific form of dissemination of information is referral service, which do not provide user with the information on documents or documents themselves, but refer him to the sources of information, which can be an information center, library or even a specialist in given field.

Selective dissemination of information is a distinct method from the wide-spread distribution of documents, references or information because it provides current awareness service tailored-made for each user.

Such a service is done by an information centre on the basis of a "profile" of the field of interest of each individual or group subscribes. This profile is formulated on the results of interviews and questionnaires. The center then "processes" the latest issues of abstracting and indexing services in print or machine readable form and matches new items of information with the users' field-of-interest profile. The SDI subscriber is thus automatically notified of all newly acquired material that matches his profile; to provide feedback he is often requested to return a card signifying whether the material is relevant or not. If the subscriber reports that a number of references are not relevant - his profile is modified to reflect his requirements more precisely. (see also chapter 6.2.3)

5. Methods of access to internal as well as external information sources with network concept

This chapter describes in a concise way the main possible methods of access to bibliographical information and of availability of data and publications.*)

Access to information means chiefly access to reference and/or bibliographic tools and usually is complemented by documents supply, which means an availability of publications required by the end user.

Access and availability of information and publication could be achieved in different ways and by different means. In the process of access and availability of information the document delivery is the most essential for the user. It could be done in whole or in part, or a reproduction of the document in response to a request. The major traffic in document delivery is still dependent upon the normal surface postal system, both for submitting requests and for supplying the document.

5.1. Industrial information sources

There is a large variety of industrial information sources which not neccesarily should be used within one company or factory.

The main information sources relevant to an industrial activity can be grouped as follows:

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*) The term publication is used in a broad sense. It covers all information documents regardless of their physical carrier - paper, tape, film etc.

5.1.1. Categories of sources

Internal sources - information materials and data from the technical, marketing and economic sectors of the company or an industrial branch.

External sources

a) monographs - books, reports, handbooks, directories etc.

b) periodicals - primary and secondary journals, newsletters, newspapers etc.

c) official publications - authority regulations, standards, official gazettes, patents, statistics etc.

d) catalogues - suppliers of equipment, raw materials, machinery including profiles, relevance and performance,

e) other sources - conferences, visits, workshops, exhibitions etc.

Access to these sources could be done either by conventional ways (directly or through booksellers, publishers, librarians) or using the modern information facilities (computer and telecommunication).

The information officer of the company or the company staff are usually involved in the evaluation of collected information sources as to their importance in relation to the current and future company goals and needs.

In evaluating - the following criteria might be taken into account:

- usefulness of the information to the enterprise,

- relevance to the enterprise experience,
- does its purpose serve the aims of the enterprise,
- does its open new possibilities for improvement or innovation.

5.1.2. Use and usefulness of industrial information sources

The use of information sources is closely linked with their application in industrial process. This could be illustrated by the following table: [Houten]

Industrial phase	Information source input
1. Awareness, idea	- monitoring journals - new information services, - technological gatekeepers,
2. Definition of project	A. External information sources - market information, - economical climate - political climate - technological forecasts, - opportunities, - threats B. Internal information sources - project records, - project reports, - financial state, - staff expertise and technological capability - internal information storage and retrieval system, - internal data file, - reference library.

3. R and D. situation appreciation and decision on methods

A. External R and D
- retrospective information search,
- literature survey,
- SDI service,
- patent information,
- ongoing R and D information.

B. Internal R and D
- prototype studies,
- system development,

C. Feasibility studies
- technical capabilities,
- market and economy,
- technological impact,
- socio-political impact,
- product liability.

4. Design
- product design,
- product testing,

5. Production

A. Technology
- appropriateness,
- new technology including technology, transfer procedures,
- staff training,
- problem solving and technical advisory services,
- material studies,
- code of practice,
- standards,
- specifications.

B. In-process development
- minor design changes,

- minor production process changes,
- maintainance procedures.

6. Marketing
- market information,
- economic information,
- socio-political information,
- government policy.

The practical value of information sources depends also on several factors such as size of enterprise, subject of application innovation of technological process or products etc.

It will be worth to cite an example of usefulness of information sources published by Economic Council of Canada. [Innovation]

Proportion of innovations of Canadian and foreign controlled firms for which outside information source is cited (by firm size).

Source	Employees 0-100		Employees 101-500		Employees 501-and-more	
	Canadian N=70	Foreign N=45	Canadian N=33	Foreign N=69	Canadian N=12	Foreign N=42
Suppliers	17	9	33	16	8	19
Customers	41	33	48	42	17	19
Competitors	11	4	27	16	17	14
Parent or Affiliate	6	38	3	37	8	52
Consultants	7	4	9	9	0	5
Trade Fairs and Associations	4	0	3	0	0	5
Independent investors	0	2	3	1	0	5
Government Research Institutes	1	0	9	3	0	0
Universities	1	0	6	4	0	0
Written sources	9	13	12	8	0	12

Note: Columns do not sum to 100% since several information sources may be cited for a single innovation.

There are three fundamental ways of organizing the access to bibliographic databases (though some mixed variants may be used)

The above mentioned example although describe the situation in one country, show clearly that one of the most significant part of information sources represent suppliers, customers, competitors and affiliate firms. Relativelly small input is obtained from written sources (literature).

5.2. Conventional methods of access to information sources

5.2.1. Access channels (see also Appendix 4)

Access to internal (company) sources of information does not represent major difficulties and does not necessitate a detailed description. It depends on the organization of information flow within the company, its size and existing information facilities.

Access to the external information sources is realized normally by: purchase of publications, visits and direct use of information, interlending or free of charge delivery (catalogues etc) - through one of the following channels:

Publishers and Booksellers - provide bibliographic and trade information on publications and respond to the market demands by making publications available for acquisition by purchase directly to the individual users or to a library. Publishing is the first step to availability of publications, and bibliographic information is the key of smooth distribution. Printed material is expected to remain the major vehicle of instruction and learning.

Industrial Information Centres - provide access to information and availability of publications and offer input to industrial planning, technology, selection and acquisi-

tion, feasibility studies, industrial management, engineering and marketing.

Libraries - the library system is one of the principal instrument for the access to information and for the availability of publications. Libraries are particularly important for long term availability, whereas publishers and booksellers are primarily concerned with current and, at least, recent material.

Information Analysis Centers - are an advanced form of information centers - and provide evaluated information on specific subject - which is a directly usable information of paramount importance to research and industry. Their work pay attention to the factual data.

Exhibitions - are one of the conventional sources of industrial information especially as far as input for designing new technology or new products is concerned (new material, new equipment and machinery).

Meetings (workshops seminars etc) - are essential information sources of personal exchange of information and serve as an intellectual input for improving the operations of the company.

Study tours - usually to firms, research centres fairs etc. - provide information relevant to participants special requests and background.

Suppliers of equipment - provide technical and technological information on new equipment or materials which could be used for improvement of technological process, products and economic indicators

The traditional - conventional methods of access and availability of information still are the basic channels in all countries, but there are more and more supplemented by channels developed by new information technology, based mainly on computers and telecommunication facilities (see subsection 5.3) .

5.2.2. Models of national systems for provision, supply and selection of publications

The provision, supply and retention of information sources at national level depends on local socio-political conditions and economic factors and will vary from country to country.

The existing solutions of documents provision and supply system can be grouped as follows: [Line, Vickers]

- Dedicated Centralized service,
- Central shared service,
- Centralizatien on few libraries,
- Planned decentralization,
- Unplanned decentralized access.

In dedicated centralized model - material needed to supplement and support local collections would be systematically acquired by and housed at a single unit. Its function would be to supply such material to other institutions as and when necessary either by loan of the original or, within the terms of prevailing legislation, as a copy. It would accept for retention material withdrawn from other libraries, whether for reasons of space or because the material is no longer of local relevance. It would also act as a national centre for international requests.

The central shared service is essentially the same as dedicated centralized service and would perform the same services. The difference is that it would not be dedicated solely to these services but would combine them with other functions such as a national lib-

rary or a technical university library. Thus many consideration of dedicated centralized service apply equally here, but there would be significant differences in cost and in the efficiency of the service.

In the model which is based on the centralization on a few libraries - the provision, supply and retention responsibilities are formally concentrated on a few (3 to 5) libraries. In many, especially developing and small countries, a high proportion of all the titles held in a country are contained in a few or very few libraries. Their stock can be used as the basis of a system.

Decentralized planned provision, supply and retention model - develops the concept described in precedent model, but responsibilities for provision, supply and retention are further developed to a significantly larger number of institutions on a more or less systematic basis.

Decentralized unplanned access is a model, which corresponds to existing practice in many countries, the collection of libraries are taken as they are and their resources are made available to other libraries or end users by means of union catalogues. As such it is not strictly an integrated system but a partial one, as it does not allow for the systematic provision of material.

Although the solution at national level could be multiple, there are some basic requirements which should be met by any system.

A national system should:

- provide all national imprints and a significant and economic proportion of foreign imprints, aiming at 70% satisfaction overall,
- supply the majority of such material on loan or as copies within maximum three weeks of requesting.
- provide access to international resources to supplement national provision,
- achieve minimum cost for levels of efficiency set,

- be simple and convenient for users,

5.3. Modern methods of access to information sources

The ways of access to and availability of information using modern information technology, could be divided into the following broad groups:

- off-line and on-line access to reference data bases,
- on-line access to source data bases (electronic document delivery),
- document tele-ordering,
- electronic reprinting on demand.

The existing data bases in machine readable form are usually classified by type of information included in the data base. Two major groups of data based could be identified:
Reference data bases, which include bibliographic and referral data (bibliographic description and abstract, directories of institutions, experts, projects etc).
Source data bases, containing numeric data, textual-numeric data and full text.

Both groups of data could be either publicly available through subscription and/or membership or designated for internal use only such as those data bases developed by governments, academic institutions or multinational companies. Most of these data bases publicly available is accessible on-line or off-line.*)

New information technology is already being applied in some countries to teleordering through co-operative systems or directly

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*) The comprehensive listing of existing on-line data bases could be find in the Directory of Online Data Bases published by Cuadra Associate, Santa Monica, USA)

by publishers, booksellers and subscription agents.

Bookselling methods are changing to take advantage of the speed and other qualities of new technology. Teleordering has reduced the time taken for the publisher to receive the order, it needs fewer staff and less equipment, is quicker and more accurate.

Teleordering uses the established trade channels between publisher and bookseller. On-line ordering is now, however, extending from of document ordering to "volume" ordering of journals and books.

This widens the amount of traffic which will bypass the bookseller and it would seem that not only electronic material but also physical format publications may increasingly be ordered and supplied without bookseller participation.

Another possibility of modern information technology access is the on-demand reprinting - directly from publisher of publications stored in electronic form. Such a reprinting can be done from a master copy stored either as digital input or as videodisc for facsimile reproduction. On-demand reprinting is merely a way of saving the investment in original printing, printed copies and storage.

The increased use of on-line bibliographic data bases has stimulated inter-library lending - as the desire to obtain the identified document as part of the same operation at the terminal ("one-stop shopping") whether the item subsequently is supplied by post in the form of printout or photocopy or whether it arrives immediately online from a full text data bases, depends on the system.

New technology is facilitating the electronic document delivery. In the USA the On-line Computer Library Centre (OCLG) is planning an overnight electronic delivery service using the full text data bases. On-line requests from OCLG interlibrary loan users, for the

full text of articles stored and indexed on one of electronic data bases will be processed overnight and transmitted via the OCLC telecommunication network.

Similar examples could be cited from France, FRG, UK and Japan.

It is now technically possible for a fully digitized international system of document delivery to work for the full text to be held and accessed electronically. The major problem is again one of economy.

5.4. The network concept

Information network is a distribution system composed of interlinked, spatially dispersed channels, subsystem and/or elements. The network can also be regarded as a distributing subsystem, as a part of some larger system. Network and its channels are composed of a single route in a physical space, or multiple interconnected routes, by which markers bearing information are transmitted to all parts of the organization. A network usually consists of a formal arrangement, whereby materials, information and services provided by a variety of organizations are made available to all potential users. Usually three or more organizations engaged in a common pattern of information echange, through communications, for some functional purposes - form a network. Computers and telecommunications may be among the tools used for facilitating communication among them. (see example in the Appendix 3)

The essential elements of such a network are - its nodes, links, information and protocol.

Nodes are loci of information input, output, storage, processing, organization, control and use.

Links are the channels of communication that bridge all nodes and through which information may pass from node to node.

They make possible the physical sharing and transfer of resources throughout the network and thereby increase the availability of information to any user. In the broadest sense links embrace all communication channels, including postal service. Nevertheless electrical and electromagnetic tele-communication lirks have the greatest potential for providing rapid information interchange among the nodes of a national network.

Information - includes documents, data and other forms of recorded knowledge.

Protocol - includes the rules, standards, agreements and contract rights relating to use of the network. These are needed to ensure the compatibility, the high quality of services and the access right to all network members.

Networking is an essential requirement for resources sharing. Some rules are basic to network operation:

- networks require acceptance of rules of procedure over which the individual participant has only limited control,
- networks require acceptance of communal responsibilities which are different from and by far exceed responsibilities assumed by simple cooperative arrangements,
- networks are complex structures. This compexity may affect the operation of individual network nodes,
- networks require the insertion of a new type of authority into the professional structure - the network manager,
- in networks, tension may arise because of differences in opinions regarding status, authority, responsibility and governance of activities. A mode of operation must exist, and be accepted by all participants, whereby such tension can be resolved without harm to network functionning.

A vital precondition to networking is data compatibility and standardization. Any deviation from international standards, whether official or not, requires much thought and exhaustive explanation as to the reason why a deviation has been found necessary.

Standardization should be applied to all possible facets of information work and to be enforced at least throughout the organization. It should be applied to classification system, the notation of bibliographic references, the identification of produced documents, the layout of publications etc. Even the terminology commonly employed should be standardized.

Standardization remains the responsibility of the central unit of the network and is the indispensable condition of normal functioning of whole system.

The information network involves several partners and facilities, which based on example of computerized on-line network, are the following:

- data-base providers or producers,
- data base vendors or operators (hosts),
- data base carriers,
- data base users.

Data base <u>providers or producers</u> are the organizations or companies that compile information and make it available in machine readable form. The production of data bases could contain one of the type of information mentioned above in this chapter (reference or source data bases).

The produced data bases can be introduced on the market in a number of ways:

- by selling the copies of produced tapes or discs of the data-bases (offline service)
- by selling the information contained in data base (online service)

- by licencing an organization for exclusive distribution of information in a geographic region.

Data base vendors or operators (computer hosts) are organizations providing data base service to end users or to intermediary users such as information centres or libraries.
Typical vendor operation involves a computer, magnetic and/or disc storage devices, telecommunication equipment and staff of specialists for programming, processing, training, customer support and accounting.

Carriers provide the data communication link between users and on-line service operators. At present communication carriers are primarily telecommunications carrier, though in the near future such mechanism as cable, fibre-lines, and broadcast may be utilized to a much larger extent for data transmission purposes. The extension of interactive videotex service delivery over cable networks is one example of this trend.

Users include "end users" and "intermediary users". End users are the individuals to whom information is passed through any number of intermediary users. Intermediary users such ac brokers and libraries act on behalf of end users. These intermediaries between the service operators and end users provide expert searching of expert operator databases and any search databases on multiple service operators on behalf of a single end user.

6. Main categories and forms of industrial and technological information

6.1. Main categories of industrial and technological information viewed from the point of the user

The aim of this subchapter is to define the environment in which the system designer (or redesigner) is going to operate. In different countries the availability of different types of information is different as well as different is their pertinence to the end-users needs in factories or enterprises. As this part of the guidlines is devoted mainly to new technologies for accessing and processing of industrial information, the existing inetrnational computerized facilities will be shortly reviewed. It is the matter of policy-makers in a country to decide which types of information are of the most vital importance for the country's development and to choose the areas on which the investment in new information technologies would be justifiable in context of usually restricted resources. It must be kept in mind that industrial and technological information system cannot be built in vacuum and the information environment as well as country's infrastructure must be taken into account.

6.1.1. Patent information

Patent information is a valuable source for industrial user. It can give him the reliable advice concerning:

- on which markets (national as well as international) his products can be sold without the need of paying royalties to patent owner
- what modifications are needed in his product to evade patent protection (or is it advantageous to buy a licence)
- what are the areas of the most rapid technological development in

which it is realistic to enter competition on national or international market

- how to define own patent policy

It is the matter of governmental coordinating body (see 1.2) to define which branches of industry should benefit from state-donated purchases of patent information, which should be authorized to use the patent information services free or at reduced cost, and which should organize patent information services of their own or use state facilities at full cost.

There exist worldwide computerized patent information services e.g. INPADOC, DERWENT and ASBA. In some bibliographic services patent information is also included. The INPADOC Centre at Vienna emits approximately one magnetic tape weekly. The tape contains bibliographic descriptions of newly registered patents of worldwide coverage and in all fields of technology. It should be pointed out, however, that frequently bibliographic description is not sufficient to infer the technical value or even idea of protected solution. There are three other obstacles (they are not necessarily disadvantages!) which must be overcome when one is intending to utilize the INPADOC tapes fully:

- the yearly increase is now of the order of 700.000 records what implies that large resources must be allocated for storage of information; moreover, the patent protection lasts for 15 years and the depth of retrospection should be of the same order
- the patent collection is a dynamic one, i.e. corrections to formerly issued tapes occur, e.g. there may be new countries in which a given solution is protected
- the only information language (to say nothing about formal descriptors like author, owner, date etc.) is the International Patent Classification and simultaneous achievement of high recall and

precision indicators (see 3.3) may be difficult if not impossible. The national focal point of industrial information may encourage the use of patent information in the following way:

- it may direct the users to an existing centralized patent information service which is usually located at the country's Patent Office
- it may advice the users to go to local information centres which specialize in a given branch of technology
- it may take the role of the patent information center in the fields of technology of vital importance for country's industrial development
- it may take the role of centralized patent information service

As far as computer potential is concerned, the proposed solutions differ substantially, from no need for computing facilities in the first case to rather big installation in the fourth case (especially mass storage must be considerably extended).

6.1.2. Bibliographic information

As it was pointed out in former chapters, bibliographic information is not the favorite one for entire industrial community. Neverthless, the access to current literature via bibliographic information is vital for some important members of this community, e.g. researchers and information officers. The latter need this access as a source for gathering factual data, which are inaccesible otherwise.

There are hundreds of bibliographic data bases produced and disseminated worldwide. As it is not the goal of there guidelines to advocate the use of some particular bibliographic databases, the organizer or redesigner of the national focal point on industrial information should consult e.g. [DIALOG] for detailed description of the scope, coverage, prices etc. of various databases.

There are three fundamental ways of organizing the access to bibliographic databases (though some mixed variants may be used)

- the end-user (or an intermediary) accesses the database in an on-line mode (either on his working site or at some predetermined access points)
- the database is bought by the country and is accessible on-line through the local telecommunication network (preferred in case of great number of customers to cut down international transmission costs)
- the database is bought by the country and is processed off-line locally, to supply the information to the users which have relatively unchanging profile of professional needs

As the main group of users of bibliographic information is outside industrial community, the main responsibilities of national focal point management are:

- to ensure that within national information policy the access to bibliographic information is secured at least for the most important branches of industry
- provide information on where bibliographic information on particular subject can be found
- provide training courses in bibliographic information search for interested industrial users and/or intermediaries.

The situation in the country, however, may be such that the only possibility to access bibliographic information by industrial user would be to organize such service at national focal point.

6.1.3. Information on standards

The need for information on standards depends on the type of industrial user and general position of industry in a given country. The information on standards is most important in the following pha-

ses of industrial activity:

- in design of a new product the information on standards concerning its constituent parts is vital for cost reduction and oven availability of those parts
- in choosing the technology and equipment for new production it is necessary to know the parameters and requirements concerning the equipment, which are often standardized (in such case national, foreign and international standards must be consulted accordingly); on the other hand, the considered technology and equipment must be compatible with national standards concerning the safety of work, maximal admitted pollution rate etc.
- before planning the dissemination of the product on the market it is necessary to check its compliance with standards valid on that market (national, foreign and international); it must be kept in mind that standards often change in time and the checking of compatibility must be systematically repeated (normally the changes are announced in advance).

The main responsibilities of national focal point in the field of information on standards are the following:

- to ensure that within national information policy the information on standards is made available for country's leading industries; the access to national, foreign and interantional standards must be provided and subject and geographical priorities should be determined
- keep the file of all institutions in the country that hold the collections of standards of broader interst and inform the industrial users accordingly (eventually this function may be performed by the national Office for Standardization)
- help the users from industry in obtaining copies of standards which are not held in the country.

In India [Subhashini] Indian Standards Institution is developing a computer based information system. It contains details of a few thousand standards. Programs for validating the input data, updating the database, and for routine report generation have been developed. An on line query system based on about 25000 key words was developed. Programs to update the key word index to Indian Standards were developed.

The Indian Standards on magnetic tapes were recorded in accordance with ISO 2709 specifications to facilitate transfer of technology among the members of the network of International Standards Organization (ISONET) which represents a cooperation agreement among standards institutes to facilitate access to information and documents in the field of standardization.

6.1.4. Information from technical reports

Technical reports can be a valuable source of information for industrial users. Technical reports are produced at technical universities, research institutes, in development divisions of industry etc. The main problem with this type of information is that institutions which are producing it are reluctant in volunteering it. This is quite understandable (for the reasons of competition) that private companies behave like that. The reluctance of government-sponsored institutions is not that clear. Nevertheless, in some countries (e.g. Poland, Soviet Union and USA) documenting of all government-sponsored research is compulsory.

The information concerning scientific and technical reports may be obtained from national and international systems dealing with that type of information.

The national focal point should encourage the design of such national system with the framework of national policy and it may be the center of such system. Wherever the center of the system will

be located, the national focal point should participate in the transfer of information: on one hand, it should gather, register and eventually pass upwards to the center of the system the information on technical reports; on the other hand it should pass the information on technical reports downwards to the industrial users (if the center is located at the focal point).

It is not recommended, especially for developing countries, to invest into the central depository of technical reports as the cost-effectiveness evaluation would be in most cases very poor. Instead, technical reports should be stored where they were produced and the copies of them should be made available to the interested parties. The producer of the technical report should determine whether copies of them can be obtained:

- free of charge
- at the cost of copying/mailing
- at the cost (of some part) of the research performed.

At international level the two greatest systems which deal with technical report literature are: The International Information System for Scientific and Technical Reports, designed by COMECON countries, located at Moscow and The NTIS/USAID International Information Transfer Network. As described by [Caponio,Post] the network now comprises more than forty local Cooperating Organizations which serve as local reference centers, conduct user education, train reference librarians, conduct marketing and promotion compaigns, and provide document order and fulfillment services. The NTIS Cooperating Organizations are located in Africa, Asia, Europe, Near East, Latin America and Caribbean, both in developing and developed countries.

The national focal point should cooperate with one or both organizations to ensure the access to technical reports literature for industrial users.

6.1.5. Marketing information

This type of information is much more heterogenous than the types described in the preceding subsections. Neither source nor format of information is homogenous. The important data of this type are - inter alia - the following:

- cost per unit of measurement of specified product on specified market
- statistical data on manufacture and sales of products
- government business regulations on imports/exports including customs duties
- characteristics of local equivalents of raw materials
- data on foreign manufacturers, they local representations, exporters/importers of certain groups of products
- firms producing similar products
- employee compensation
- government taxation
- market development trends

In most cases it should not be the obligation of the national focal point to supply the all data listed above. Nevertheless, in some developing countries it would be profitable for industrial users to have one access point to e.g. all documents concerned with legislation on commerce and industry. A higly qualified consultant in these matters could be of great value, especially for users from small industries.

6.1.6. Other types of information

Many industrial firms, especially small firms in developing countries cannot afford an information unit, partly because of economic considerations and partly because adequately educated personnel is not available. Hence, there is a need for experts and consultants which will interpret the information, often highly specialized, for

the industrial user. Such experts should cooperate with the national focal point and it should be the duty of the national focal point to organize its teams of experts.

For some problems, posed by the users, it may be impossible to find solution even with the team of national experts. In such a case the problem should be precisely formulated and passed to INTIB for possible solution.

6.2. Main forms of industrial and technological information supply

The aim of this subchapter is to point out those forms of information supply which can and/or should be computerized. The stress will be put on the formats and methods of presentation suitable for electronic processing.

6.2.1. Information on information

As it was discussed in 3.2. the referral activity is a very important function of an industrial focal point at national level. Indeed, it is hardly to expect that the entire problems of industrial users could be directly solved by the focal point. Instead, efficient referral system at national level can reasonably shorten the user's path to relevant information and/or solution.
To this end, the files containing the referral information should be kept at the national focal point. For example, the following files may be useful:

- description of country's libraries
- description of country's archives
- description of country's information centers and services

These files kept at the national focal point should be the sub-files at the national level, which contain all data on country's information infrastructure. Such inventory of information facilities should

be designed according to guidelines [Vilentchuk] and contain the data listed there. For effective referral service at national focal point some data items should be deleted (mainly these which describe details of internal organization) and new data items should be introduced (mainly these which are of interest for the user, e.g. more detailed subject characteristics, details concerning the services). As it would be uneconomic to collect all the data for all information institution, it should be the responsibility of national focal point to determine the data needed, collect them and keep them up to date.

In many developing countries information infrastructure may be inadequate to ensure the access to sources important for industrial user. Hence, the international cooperation and aid is necessary. Firstly, for most typical requests of users, the national focal point should collect the data concerning foreign and international institutions which could help the user in accessing information. As some problems may be common for countries in some regions, the cooperation of national focal points in these countries should be encouraged and coordinated by INTIB.

Other files may help the focal point in servicing its industrial users, viz.:

- file of experts available in the country in different fields of industrial and commercial activity
- file related to most important technologies used throughout the country with reference to the institutions using them
- file of governmental and other agencies which can supply the marketing information.

The national focal point should be also able to supply the users with the information on these topics on international scale. This may be achieved by close cooperation with UNIDO.

The files described above are normally of rather small size, i.e.

do not exceed few thousands of records. The structure of these files is flat, i.e. there are no interesting relations between records from the same or different files. Hence, the appropriate computer installation for the purpose is typical microcomputer with at least two floppy discs and a printer (see Appendix 8). Practically every microcomputer on the market has sufficient operating system and standard software for the job, so this activity gives no hints to the selection of a particular software and hardware. The content of the file of information facilities should be in compliance with [ISO 2146 -1972]. The exact format of all files discussed above is not standardized but would be advantageous for exchange of information to work out common format for the purpose and compatible software and hardware. Such task could be undertaken e.g. by some project of INTIB.

The problem whether computerize or not the referral activity cannot be resolved at this level of discussion. Generally, big number of aspects in requests, speed of operation and, eventually, simplicity of update are pros, while the number of records in most cases is not.

6.2.2. Periodical bulletins and listings

One of the activities of the national focal point should aim at keeping the users aware of new developments in industry, situation on interesting markets, new focal point holdings, new translations of technical documentation from foreign languages etc. The main criterium of selection of items for such bulletins and listings is the number of potential users: each bulletin or listing should contain information which is valuable to reasonable part of subscribers. In most developing countries there will be no need to computerize this activity. The only exception is when the focal point organizes computerized catalogue for its holdings, translations etc.; in such

a case acquisition lists, listings of new translations etc. can be easily produced by computer, as a by-product of its main task of keeping the catalogue. The size and type of hardware and software follows normally from the main task.

6.2.3. Tailored periodical information supply (selective distribution of information)

The periodical bulletins and listings can fulfill only a small portion of industrial user needs. The main reason is that, as it was pointed out in the preceding subchapter, they should the information of wide common interest. It would be uneconomical to fulfill more specific needs of individual users through increase of bulletin and/or listing size. Therefore, another method of user servicing should be employed. The method is known as selective dissemination of information and its principles are the following:

- the user determines his/her interests in a formal or informal way; in the latter case the personnel of SDI service must formalize the request,
- all formalized users requests are filed and form the file of user's profiles,
- the data to be distributed form the information file,
- the records of information file are scanned against the records of profile file; if match is found then the information record is attached to the set of answers for a given request (user).

Even though the above description does not state explicitly that the operations on files are performed by a computer, practically it is the only possibility even for not very big size of files. As the user request normally involves numerous aspects (descriptors) the manual search would be an extremely tedious work.

The information file is usually obtained in the form of magnetic tape (from a database vendor) and contains information covering a

determined period of time (from one week to several months). Each tape is processed and the results are sent to the users. Thus, each user receives regularly the information which contains - in ideal case - no more and no less data that he really needs. The ideal is different to reach in practice for the following reasons:

- the user cannot describe his needs in a formalized way, which is adequate for the database; the translation of informally expressed needs to formalized requests may be, and often is, inaccurate,
- the database does not contain the data that the user thinks, it does,
- the user interests may vary with time.

To overcome these obstacles it is necessary to train the information officers at SDI service in the design of profiles. The other means used to improve the quality of SDI is relevance feedback from the user. In such a case the user receives the answer in duplicate, and on one copy assesses each item (usually as very good - fair - on the boundary of interest - irrelevant) and sends it back to the SDI center. User feedback is analysed there and his profile is eventually corrected. Using of this technique is especially recommended for fresh users of SDI and in initial phase of that activity.

For instance, at the Universiti Sains Malaysia [SISMAKOM] an SDI service from the tapes "Chemical Abstracts" and "Food Science and Technology Abstracts" was organized. For information processing the IBM 370/148 computer was used and together with CDS/ISIS software package for information retrieval the CAN/SDI package was installed. At the end of the experimental use of the system (1982) there were 102 users. The average percentage of relevant items for CA was 52% and for FSTA - 61%. The users were asked to give time estimates in hours per typical working week for information search before using

the computerized service and with computerized service. With computerized service, on average, each user indicated a saving of 3 hours per week (156 hours yearly). It has been estimated that in monetary terms this saving is equivalent to $ 897 - $ 1185 per year per user.

At Pakistan Institute of Nuclear Science and Technology [Akbar] SDI service for scientists and R&D engineers was introduced using PDP-11 minicomputer for processing INIS data base. In this case INIS tapes were obtained free of charge in exchange for the tapes with information generated in Pakistan on Nuclear Science.

It must be kept in mind that in case of SDI service from bibliographic databases (i.e. giving references to some information sources) the access to the sources themselves must be secured. Otherwise it would cause users' frustration and many users will stop using SDI.

The typical carrier of information is magnetic tape, as floppy discs have to small capacity and hard discs are too costly and inconvenient in handling. Hence, for SDI service mainframe and minicomputers are used as microcomputers are not usually equipped with tape units and hard line printers (dot matrix printers are not well suited for large amounts of printing).

6.2.4. Retrospective search of information

For many industrial applications the SDI service is not sufficient as the user must know not only the most recent information but also the information on the subject for some past period (e.g. patent information). Therefore, the database for that period must be cumulated or accessed at the site where it is already cumulated (usually such data base is accessible at data base vendor and/or producer). The cumulation of information from purchased tapes needs a software that can be produced within approximately 8 man-months

(or obtained from the database producer).

While the SDI service can be organized using batch made processing it is not recommended to organize the retrospective search of information in that made. Firstly, the need for retrospective search arises irregularly and it would be inconvenient to load the cumulated database for just one query; on the other hand, waiting until sensible number of requests will be collected could result in delays unacceptable for some users. Secondly, the query must be expressed very precisely, as in batch made once the processing of the query has been started there is no possibility of correcting in. Hence, the first formulation of the query must be appropriate or the answer would have poor recall and precision ratio (see 3.3). It is hard to except that the information officer (let alone the end user) will be able to do that. Therefore, the apparent solution is the on-line search where there is a dialogue between the user and the system. During this dialogue the user can, inspecting partial results of search, refine his query until it represents his needs adequately. The requirements for computer resources for on-line retrospective search are high, especially for hard disc storage. For example, cumulated database for one year of INPADOC would require approximately 600MB disc storage. The efficient retrieval system is necessary to keep the response time low. The increasing member of on-line users increases the need for main memory. [Janssens] cites the results of Hewlett-Packard performance tests: The response time of a HP series 64 with 4MB memory and 90 terminals is comparable to a HP series III with 2MB and 20 terminals. The HP series 64 with 2 MB becomes bound at 50 terminals.

The price range for hardware used for on-line retrieval of 200 - 600 MB databases in system DOBIS and WIN is more than $ 100 000. [Keren,Sered]. According to the same source, there are the following software packages suitable for on-line retrieval from

large cumulated data bases:

- ADLIB, produced by LMR Computer Services, Lipman Management Resources Ltd., for Prime computers, memory range 512K - 8MB, disc memory 32MB - 2400MB, 1 - 128 terminals, 1- 128 printers, maximum number of records 100 000 000.
- AWA-URICA, produced by Amalgamated Wireless Australasia Ltd. for Microdata Computers, memory range 128K - 2MB, disc memory 50MB - 2GB, 1 - 127 terminals, 1 printer, no software limit for the number of records.
- BASIC, produced by Batella Columbus Labs, for VAX 11/780, IBM 370, IBM 303X, IBM 43XX, Univac 1100 series, CDC 6000, CYBER series, PRIME; min memory 600KB virtual, disc memory depending on the size of data base, no software limit for number of terminals, no software limit for number of records.
- BLIS, produced by Biblio-Techniques Inc., for IBM 370, IBM 30XX, IBM 43XX, IBM System/38; memory range 2MB - 16MB, disc memory 317MB - 635MB, 2-500 terminals, 1-500 printers (counted as terminals), maximum number of records 16 000 000.
- BVS, produced by Siemens-AG, for Siemens 7531, memory range 512K - 1MB, disc memory depending on database size, 2 - 255 terminals, no practical limit on the number of records.
- CDS/ISIS, produced by UNESCO/LAD, for IBM 360/370 and compatibles, min memory 512KB, disc memory depending on database size, number of terminals limited by CICS environment, maximum of records 16 000 000 (in older releases 100 000).
- DOBIS, produced by Universitaetsbibliotek/Hochschulrechenzentrum Dortmund, for IBM 370/158, min memory 1MB, min disc memory 200MB, no software limit for terminals.
- DOBIS/LIBIS, produced by IBM, for IBM 370, IBM 303X, IBM 43XX, min memory 100KB, disc memory depending on database size, so software limit for number of terminals, maximal number of re-

cords 2 000 000 000.

- GOLEM, produced by Siemens-AG, for Siemens 7500, 7700; memory range 500KB - 16MB, disc memory 72MB - 840MB, up to 250 terminals, no software limit for number of records.
- GRIPS, produced by Deutsches Institut fuer Dokumentation und Information, for Siemens 7XXX, min memory 1MB, number of terminals installation dependent, maximum number of records 16.000 000.
- INQUIRE, produced by Infodata Systems Inc., for IBM 370, IBM 30XX, IBM 4300; min memory 250K, min disc memory 1 unit, number of terminals limited only by OS, maximum number of records 16 777 215.
- IRS AIDOS DIS/ES, produced by VEB Kombinat Robotron, for EC1020, EC 1033, EC 1035, EC 1040, EC 1055 and IBM 360; min memory 128KB, min disc memory 1 unit, 29MB, max number of terminals 16, no software limit for the number of records.
- MINISIS, produced by IDRC Canada, for Hewlett-Packard HP 3000, memory range 256KB-8MB, disc memory 27MB-404MB, number of terminals limited only by hardware, maximum number of records of the order of 10 000 000.
- NOTIS, produced by Northwestern University Library, for IBM 370, IBM 30XX, IBM 43XX; memory range 1MB-16MB, min disc memory 400MB, no software limit on number of terminals and records.
- PEDMS, produced by Infodas GmbH, for LSI, PDP-11, VAX 11 all models, MODCOMP and ATM; min. memory 256, min disc memory 10MB, no software limit for number of terminals and records.
- R-CDS/ISIS, produced by Institute for Scientific Technical and Economic Information, for RIAD computers, min. memory size 500KB, min. disc memory 30MB, no software limit on number of terminals, maximum number of records 1 000 000.
- ELN, produced by Washington Library Network, for IBM 4341, memory size 2MB, disc memory 600MB, up to 500 terminals, 16 million records per file.

These examples do not form an exhaustive list, the parameters are those claimed by producer/vendor. The price range for source code is in most cases $ 50 000 - $ 100 000 (CDS/ISIS and R-CDS/ISIS and MINISIS are free of charge for nonprofit organizations).

It is not expected that the national focal point will be the centre for retrospective retrieval from large databases. The information given above is to prepare the management of focal point for cooperation with such retrieval center by giving typical characteristics of available software packages. The role of national focal point will be rather to organize access to large databases for industrial users and to train them in using the terminal.

6.2.5. Data analysis and search of information for revealing trends in technology

The national focal point should inform its users on the trends in technology. Usually, the only way to do this would be to cooperate with experts from its team and use their expertise. To enable their work it will be necessary to give them access to internationally available databases and order the copies of relevant material. The possibility of obtaining this material is even more important for experts than for casual users. Hence, obtaining a terminal, communication facility and funds for interrogating appropriate databases is vital for this form of activity. Another solution is to pass the requests for trend analysis to INTIB and ask for help of international experts.

6.2.6. Data analysis and search of information for market forecasting

There are several databases containing information concerning situation on different markets which are available e.g. through

[DIALOG]. This is a valuable source for experts preparing forecasts for specific markets. The experts may prepare the forecast (or actual report) on request passed to him from industrial end user or an end user (especially in bigger companies) may prefer to analyse situation himself. In both cases a terminal, communication facility and funds for extracting the appropriate information from the databases discussed above is the most effective way to perform the task. As the situation on many markets is often unstable the speed with which the task is performed determines the effectiveness of the actions taken on the ground of market analysis. The data extracted from databases are of factual type (e.g. prices, percentage of the market for particular producer, volume of sale etc.) no additional sources need be supplied.

The national focal point should also collect the information from the local market to enable local forecasts and to inform local users (especially from small industries) about actual market situation. To this end, a file must be kept, at least for the goods and raw materials most important for country's economy. The computerization of this file is not a must but it can be computerized using the same hardware that is used for accessing the external databases.

7. Hardware and software specifications

The aim of this chapter is to describe the features of hardware and software in the context of their application in computerized activities of a focal point. The main functions that can be computerized were discussed in chapter 6. From that discussion it follows that in most cases only a medium or small configuration will be needed, which is colloquially referred to as mini- or microcomputer. This chapter is meant not to be the guideline for a computer man but to be some form of aid for non-computer specialists who have to discuss with professionals the projects of computerized information systems.

7.1. Hardware specification and operational systems

The aim of this subchapter is to deescribe the parameters, features and properties of hardware which are important from the point of view of information systems (not going very deep into technical details). Typical hardware models and configurations are given in Appendix 8. The problem of operational systems are included here because once hardware is selected there is little choice for operational system.

7.1.1. Central processor unit

Central processor unit is the core of every computer. It receives the signals from other parts of computer system and emits signals that control and coordinate the work of these parts. Main task of central processor unit are the following:

- to read and identify the command from main memory
- to execute the command
- to determine the next command in the memory to be executed

The execution of the command may cause another access(es) to the

memory to read or store the arguments of the command. Another typical examples of commands are those which, when executed, cause reading or writing a character from/to mass storage or input/output device, cause some transfer of the content of CPU's internal registers, perform arithmetic or logical operation on its arguments, or initialize some action of some other part of computer system. For purely technical reasons in one cycle of its work CPU processes the arguments of a fixed length. This length is called the processor's wordsize and is one of its important parameters. For typical microcomputers typical wordsize are 8-16 bits, for minicomputers -16-32 bits and for mainframes - 32-80 bits (fast development of technology may affect these demarcation lines). The processor's wordsize is not normally "visible" for the end user of the computer as it is "shielded" by software (see subchapter 7.2). For system planner it may be an important factor as the appropriate software can be not available for a given wordsize; generally, the shorter the wordlength the slower the computer performs given end user operation (in relation to the physical speed of computer).

The speed of CPU is another important parameter. It can be expressed in the form of average number of commands per second or as the frequency of CPU's clock (if it exists). Typical frequencies are in the range 0.5 - 50 MHz. CPU's speed, if not affected by other computer components has linear effect on the speed of operation of the whole system.

A qualitative feature of CPU is its command repertoire. It is more important for software producer than for application system planner only indirectly, poor repertoire of commands may result in poor software performance.

7.1.2. Main memory

Main memory is used to store the commands to be executed by CPU and data which are the arguments of these commands. As CPU can read directly only the commands, from main memory (it cannot, for physical reasons, read commands from mass storage, (see 7.1.3) every command before execution must be transferred to the main memory. The most important parameters of memory are:

- cycle time, i.e. full time needed to read or write a word to/ from memory; typical cycle times are in the range 1 us - 50 ns
- capacity, number of words or bytes (1 byte=8 bits) that can be stored in the memory; typical capacities of main memories range from 48KB for small microcomputers 128KB - 2MB for most typical minicomputers up to 16MB or even 30MB for big mainframes (the boundaries are of course very fuzzy and change with the development of technology)
- extendability, i.e. capability of extending the capacity of memory by adding new modules (this is connected with the computer addressing system and/or technical limitations e.g. power supply)

The cycle time is important factor for the speed of operation of computer system. Generally, it must be harmonized with the speed of CPU and another parts of the computer like mass storages, input/ output devices, teletransmission etc. Otherwise, some devices must wait until other(s) device(s) complete the operation and are not effectively utilized. The ideal is unlikely to be achieved but high degree of harmony is essential for system productivity.

The capacity of memory limits the length of programs that can be executed without transmisions of some parts of it from mass storage. Regardless the organization of these transmissions (including so called virtual memory system) it slows down the system. To cooperate

with terminals and other input-output devices some portions of the memory must be assigned to them: the greater these portions are, the smoother the cooperation. In that sense the capacity of the memory limits the number of terminals (along with the speed of ensemble CPU-memory).

The main memory may consist of a RAM part (random access memory capable of reading and writing) and a ROM part (read-only memory). The latter, as the name suggests, cannot change its contents once it has been set by the manufacturer. ROMs are used to store constant programs (e.g. operational system, see 7.1.5) and constant data. There are many variants of ROMs, some of them e.g. EPROMs (electrically programmable ROMs) can have its contents changed using a specialized device.

Depending on the technology used in the production of RAM this part of main, memory may be volatile (i.e. its contents evaporates when power supply is switched off) or not. For some applications it is of vital importance that the main memory is non-volatile (or it is made pseudo non-volatile by adding e.g. a special battery system).

7.1.3. Mass storage

As the technologies used for main memories are relatively costly it is not possible to achieve its capacity to be adequate for many applications (i.e. to store the program and the data there at the same time). Therefore, many types of mass storages has been developed which offer much lower cost per bit stored and much greater capacity. The price is, as it could be expected, the access time. The most popular mass storages are:

- magnetic tapes
- floppy discs (or diskettes)
- hard discs

In all three cases the information is recorded magnetically on 1/2 inch tape, 8, $5^{1}/4$ or 3 inch elastic diskette or on the surface of a hard disc. Magnetic tape, floppy disc and hard disc drives are the devices used to write or read data to/from carrier. As on magnetic tape the data are stored sequentially, it may take many seconds to rewind it to the place where the data should be placed or taken out. Therefore, magnetic tape is used nowadays mainly for archivising and exchanging of information, not for entire processing as it has been not so long ago. For example, the computer in which only magnetic tape is used cannot (practically) perform on-line search. The fundamental standards of recording are 800 bpi, 1600 bpi and 3200 bpi (bytes per inch).

As floppy and hard discs are rotating media, each data can be accessed in about one revolution time which is of the order of several milliseconds. The capacity range for floppies is about 100KB - 1 MB, for hard discs 5MB - 600MB.

As the magnetic carrier can be taken out from the drive and put in another drive of (another) computer, it can be and is used for exchange of information. In that sense the magnetic tape floppy or hard disc drives may be considered as input/output devices. In practice, for exchange of large portions of information mostly magnetic tape is used (floppy being too small and hard disc to costly and unhandy). When exchanging information on magnetic tape, access to a drive with appropriate recording density is necessary.

7.1.4. Input/output devices

The function of input/output devices is to transfer the data from the user to the computer and vice-versa. Besides devices mentioned in the preceding subchapter, there are many kinds of input/output devices. The most popular of them are:

- keyboards (with VDU - video display units - or with coupled

printers)

- optical characters readers (OCR) which can read standardized typescript
- optical bar code readers
- terminals which are computers themselves and feed information into bigger computers directly or through a transmission line.

An economic way for preparing input data for bigger computer or for exchange of data with other information center is to utilize a specialized micro- or minicomputer with a disc memory and tape drive for producing magnetic tape output. There may be many keyboards with VDUs working simultaneously.

Input via paper tape or punched cards is decidedly obsolete.

For output, many types of printers are used, which produce hard copies of the processing results. Their speeds vary from about 20 characters per second to more then 1000 lines (each containing more than 100 characters) per second.

VDUs which are used at input for displaying inputted text are also used as output devices to display the "computer part" of the dialogue. The same is true for terminals.

7.1.5. Modes of operation and operating systems

The computer performs its tasks executing commands from its repertoire properly assembled in a program. It would be however extremely difficult and inconvenient for a user to program in every detail each computer action. For instance, detailed program for transmitting some portion of data from a disc to a printer would typically involve hundreds of computer commands what would be a very tedious work and detailed knowledge of hardware would be needed. Hence, to facilitate the programming, the programs realizing the tasks most often needed are included into a so called oper-

ating system. Then, each time the particular task is needed, the programer has only to activate appropriate part of operating system, eventually give the parameters of the task and the rest will be done by operating system.

The other part of operating system is connected with the following problem: the commands of the computer are very primitive and to assemble a program from these commands is extremely tedious. On the other hand, the computer can execute only such programs, expressed in the machine language and stored in its main memory. This situation caused the rapid grow of so called high level languages (HLLs) which allow the programer to express his tasks in terms much closier to the problem being solved than to the machine language. The only thing to do is to translate the program in HLL to machine language. Fortunately, HLLs are formal languages and programs written in them can be automatically translated to machine language by a program called compiler. Compilers are included in operating system and now the programer has only to activate compiler of appropriate HLL, input his program in this HLL which will be automatically translated and then executed. From now on, the programer may forget the command repertoire. Unfortunately, the programs in HLL translated to machine language of computers of different make may give different results due to hardware differences or compiler construction (see also 8.2). The most popular HLLs now are BASIC (for early microcomputers) PASCAL (for all categories of computers) COBOL (for business applications), FORTRAN (numeric calculations), ALGOL (scientific calculations) LISP and PROLOG (artificial intelligence applications) PL/I (general, ADA (concurrent problems) and hundreds of others for variety of applications.

The mode of operation of most commercially available microcomputers resembles that of early computers in the '50s i.e. the computer has one user and performs one task from the beginning to the end. One can say that the user is the exclusive owner of all computer resources. As the computational power of computers grew up it was found ineffective for a computer to have only one user and one task because e.g. user errors or slow response to computer question mean long periods without sensible activity of computer. To avoid this, another mode of operation was adopted: multi user multi task. The operating system in this case has also another function: to allocate dynamically computer resources to users and tasks and coordinate the work of the whole system. The most widely used operating systems for microcomputers, on which software packages for information and library applications are based are the following: APPLE DOS (461 packages), CP/M (270), MSDOS (233), PCDOS (185) and TRS DIS (144) [Chen, Hu].

For minicomputers, the most widely used operating systems are: MPE IV, RSX-11M, PRIMOS and UNIX.

7.2. Software specification

The aim of this subchapter is to point out the most important technical properties of software from the point of view of the designer trying to provide appropriate means for realization of formerly chosen functions of the system. An overview of existing software will be given and trends in software development will be briefly discussed.

The using of HLLs, discussed in the preceding section, even if it facilitates programming for a programmer is not sufficiently simple for end-user in the field of information. The reason is that the most popular HLLs are too general to express the requirements

of the user and he still has to go too much into the details of data processing. Hence, several software packages were written which leave as the part visible for user only those elements of data structure and only those tools which are needed by him.

7.2.1. File structure

The data used in information and library activity are organized in files. The files consist of records of one or more types. Each record is a unit information like bibliographic description, description of an institution (in a file of institutions), description of a situation of a given product on a given market (in a file of products) etc. The records in turn consist of fields which may be subsequently divided into subfields etc. thus forming a structure which is complicated, especially when the objects described in a file do have complicated structure. The file and record structure in absence of software packages must be fully user defined and his requirements must be expressed in the form of some HLL program using the names of files, records, fields and subfields, dutifully describing on the level of HLL e.g. how to find the records with the given texts in the fields AUTHOR and ISSN. When a software package for given application is available, the definition of the file may be reduced to giving only some parameters (e.g. field length) of a general structure. The programs of the packet use the parameters to organize the retrieval of records from the file efficiently, so that the user is not bothered with the details of retrieval and has only to determine its goal and express it in a simple language, e.g. RETRIEVE FROM MANUFACTURERS WHERE PRODUCT IS TV-SET AND MARKETSHARE > 10.

7.2.2. Data models

For some applications the "prefabricated" file structure is inappropriate and it is easier for the user to determine what are the entities in the real world, what are their attributes and what are interesting (from the point of view of the application) relationship between the entities. This is generally true for finding relationship between entities which are described by factual data.

There are three main models of data, viz. network [CODASYL] hierarchical [IMS/US] and relational [Codd]. The software packages that support such models are referred to as data base management systems.

7.2.3. Mode of operation

There may be different modes of operation of the software package. The first one, described briefly in 7.1.5. (one user, one task) is appropriate for retrieving from a small database (e.g. on experts) by an information officer at national focal point. For SDI service another mode of operation is appropriate - there are many user profiles to be processed and each user profile in not changing during processing. Hence, it is recommended to use the batch mode of processing.

For national focal point those two modes of operation would be probably sufficient. For retrieval from foreign data bases, only small software support is needed at the terminal and the software supporting retrieval is located at host.

If a decision was made to create a local database to be accessed from several local or remote terminals - what is unlikely in developing countries - then the on-line multi users mode of operation must be adapted.

Modes of operation are supported by operating system.

7.2.4. Portability problems

The variety of computer makes and operating systems (usually on one computer type one or very few operating systems can be installed) leads to a situation in which given software package works on a given computer type (or at least on the family of such computers having the same operating system) only. This is a disastrous situation for a computer system owner, as once he would change the computer type he would be threatened with the necessity of changing the software packages used. Some software producers claim that their packages are portable to several computer types - such claims must be treated with caoution and throughly checked.

There is an effort to facilitate the portability of software supported by IBM and DEC. The UCSD (University of California San Diego) system provides translation of PASCAL programs into programs in "p-code", the machine language of some abstract p-machine. Adding to a new computer the interpreter of "p-code" one may expect the full compatibility of "p-code" programs on computers with such interpreters. Such method was used in the development of [IV+V] software package but the final documentation is not available yet.

7.2.5. Review of mini- and microcomputer software packages

The review is based on [Keren,Sered], [Chen] and [Chen,Hu].

NAME: AMBER

COMPUTER: DEC PDP-11, VAX

MAIN FEATURES: Bibliographic search

PRICE RANGE OF SOFTWARE: Object code up to $ 5,000

PRICE RANGE OF HARDWARE: $ 10,000 to $ 50,000

NAME: CHECKMATE

COMPUTER: Radio Shack, TRS80 Model II

MAIN FEATURES: Keyword searching using Boolean operators

PRICE RANGE OF SOFTWARE: Object and source code up to $ 5,000

PRICE RANGE OF HARDWARE: $ 5,000 to $ 10,000

NAME: COSTI - SDI

COMPUTER: DEC PDP 11/24, PDP 11/34, PDP 11/44, PDP 11/70

MAIN FEATURES: SDI

PRICE RANGE OF SOFTWARE: Source $ 50,000 - $ 100,000, object $ 10,000 - $ 50,000

PRICE RANGE OF HARDWARE: $ 10,000 - $ 50,000

NAME: DOCSYS

COMPUTER: DEC VAX 11/730, VAX 11/750, VAX 11/780, VAX 11/782

MAIN FEATURES: Production of 6 types of library catalogs, creation of database and on-line retrieval in a multi-user-environment

PRICE RANGE OF SOFTWARE: Source $ 10,000 - $ 50,000, object $ 5,000 - $ 10,000 for developing countries object up to $ 3,000

NAME: GS-500

COMPUTER: APPLE II+

MAIN FEATURE: Acquisition System

PRICE RANGE OF SOFTWARE: Object $ 5,000 - $ 10,000

PRICE RANGE OF HARDWARE: Up to $ 5,000

NAME: HOMER

COMPUTER: SUPERBRAIN

MAIN FEATURE: TEXT RETRIEVAL, WORD PROCESSOR

PRICE RANGE OF SOFTWARE: Object $ 10,000 - $ 50,000

PRICE RANGE OF HARDWARE: $ 10,000 - $ 50,000

NAME: MICRODIALOG

COMPUTER: SUPERBRAIN and PET Commodore under CP/M

MAIN FEATURE: Self teaching program in the use of Lockhead DIALOG

PRICE RANGE OF SOFTWARE: Source code 35

NAME: MILOR

COMPUTER: Hewlett-Packard HP 1000, HP 3000

MAIN FEATURE: Information retrieval for private files of specialized information centers

PRICE RANGE OF SOFTWARE: Object $ 10,000 - $ 50,000

PRICE RANGE OF HARDWARE: $ 10,000 - $ 50,000

NAME: MINISIS

COMPUTER: Hewlett-Packard HP 3000

MAIN FEATURE: Generalized information retrieval system, accepts and products the tapes in the ISO 2709 exchange format

PRICE RANGE OF SOFTWARE: Object $ 10,000 - $ 50,000, free for developing countries

PRICE RANGE OF HARDWARE: More than $ 100,000

NAME: PLIDOS

COMPUTER: Commodore 8032, 8050

MAIN FEATURES: Information storage and retrieval; terminal software for telecommunication at 300 baud to external data base;

PRICE RANGE OF SOFTWARE: Source up to $ 5,000; Object up to $ 5,000

PRICE RANGE OF HARDWARE: Up to $ 5,000

NAME: RTFILE

COMPUTER: DEC PDP 11, LSI 11 All models

MAIN FEATURES: Relational database management system

PRICE RANGE OF SOFTWARE: Source $ 10,000 - $ 50,000, Object $ 1,500 - $ 7,000 depending on options

PRICE RANGE OF HARDWARE: $ 10,000 - $ 50,000

NAME: SAF

COMPUTER: Micro with min 64KB memory, processor Z80, 8080 or 8085 and CP/M or MP/M or 8086, 8088 processor and CPM-86 or MP/M-86

MAIN FEATURE: General purpose information retrieval

PRICE RANGE OF SOFTWARE: Source more than $ 100,000, object up to $ 5,000

PRICE RANGE OF HARDWARE: $ 5,000 - $ 10,000

The examples were chosen using the following criteria:

- products ready in 1982 were taken into account, only
- software packages with hardware involvement greater than $ 100,000 were excluded (with one exception of MINISIS which can be obtained free by developing countries)
- software packages having less than two outside users were excluded
- software packages dealing only with library management were excluded
- packages with similar main features were not repeated.

7.2.6. Trends in software development

The Microuse database [Chen,Hu] consists of almost 1500 descriptions of software packages (1984) of potential interest to library and information applications. It may be noted that all 8 highest priced packages (over $ 10,000) are for library management applications while typical packages for information retrieval and

relational DBMS, which are of interest for national focal point are in the price range $ 200 - $ 700. Typical representative of relational DBMS, DBASE II has a price tag $ 400.

After 1983 another tendency appeared: the dramatic shift to 16 bit microcomputers (like IBM PC/XT and compatibles) began. While the software for 8 bit microcomputers still dominates in number, the software producers moved to 16 bit with greater memory (256 KB or 512 KB) and are capitalizing on greater computational power offered by these computers.

8. Software selection

The aim of this chapter is to focus the attention on the problems of selection criteria and typical selection procedures to follow when shopping for a software system. It must be kept in mind that some criteria are bound to the merits of particular software system and some are the consequences of buyer's actual and future needs. In many sources e.g. [Keren,Sered], [Chen,Hu] several factors characterizing software systems are given but the decision whether given factor is important for given application is in hands of system planner or manager.

8.1. Criteria of selection of software in relation with upgrading of industrial and technological information services

The first criterium is to take into account the general properties of the software system, viz.

- can the system perform the functions (of 4.) that are planned for a national focal point?
- does the system ideally fit the application or some adaptation is needed to meet the requirements?
- is the software system capable of adjusting it to future upgrading?
- is the system undersized or oversized for the needs and/or staff availability?

This criterium is a good filter that can eliminate many software systems not worth considering.

The second criterium is to consider compatibility of hardware and software. There is no problem if both are bought at the same time from one vendor (as he takes the full responsibility). On the other hand, if a software syste, is to be installed on an existing

computer then the compatibility issues must be carefully taken into account:

- is the main memory sufficient for the software and, if not, can it be extended?
- is the number and parameters of existing peripherals sufficient and, if not, additional peripherals can be attached or replaced?
- if other jobs are to be performed at the same time, will the responsiveness of software system be maintained?

The crucial decision is whether to acquire a mainframe, mini- or microcomputer. As it follows from the preceding chapters, for national focal point the decision is practically limited to mini- or microcomputer - even if one takes into account that the lines of demarcation between mainframe, mini- and microcomputers are rather fuzzy.

The third criterium is to consider the ways and means used in the realization of software package. To be more specific, one has to consider the programming language used in the source code of the package. Two dangers have to be avoided:

- firstly, especially when vendor claims that the package works on many computer makes, one has to throughly check that the available compilers of the language are really compatible from the point of view of the package (generally, in spite of existing ISO standard for most popular programming languages, they are not); if not, additional amount of work for adaptation must be estimated
- secondly, programmers familiar with the package's language must be available; otherwise, any future changes of the package, even minor, will be impossible. It is not recommended to acquire only the object code as no changes in the system will be possible in practice. It is recommended that some provision be made for availability of the source code.

A software package may be tailored to a specific task - e.g. SDI service or it may be a general one - e.g. a data base management system. Both types may be appropriate for functions planned at the national focal point. The first group of software packages is recommended for users with no great experience; as the new applications arise, new packages for these applications can be bought. The general packages require much more thorough planning from the start and imply costly commitment that cannot easily be gone back (tailored packages are usually much less expensive).

The fourth criterium is to consider the user interface of the package. It is especially important when the users are novices in the interaction with computers. [Cypser] enumerates the main sins of computer system at interface with user:

- it is not functioning when it is needed,
- it regularly produces on overload of information that is too difficult to digest and unnecessarily filled with inconsequential items,
- it requires excessive training to do the relatively simple jobs that are most frequently needed,
- it provides poor response-time or turn-around time to user requests,
- it confuses needlessly by requiring the use of different terms or procedures, at different times, for virtually the same function (it is system administrator to be blamed),
- it leaves the user helpless and uncertain on how to move to next step or how to recover to from mistakes.

The fifth criterium is to estimate the overall cost of system installation and maintenance. Together with the costs of software (and possibly new and additional hardware) the following factors must be taken into account:

- is the existing space and eventually power supply adequate for the installation?
- how much of manpower and funds is needed to create local databases in a particular software package?
- what are the costs of running the system in normal exploitation?
- how costly is eventual conversion of files?
- what are the costs of training?

The sixth criterium is to access the documentation of the software package. Appropriate provisions must be made to obtain at least:

- System documentation which describes the functions of package's programs, the files used and the interactions between them.
- File documentation which describes the formats of all files and indicate the programs that access them and the purpose of each access.
- Program documentation which describes in detail all programs and procedures used in the software package. It should contain the descriptions of all interactions with operating system, explain the role of variables, data flow and control flow, list the error messages etc.
- User manual: a step-by-step guide to everyday operation. It must describe in detail what commands to give, valid replies to prompts, error-recovery procedures, termination of operations, typical screen displays etc.

Without appropriate documentation the buyer is completely at the mercy of the vendor and neither repairing of the system after serious collapse nor upgrading of the package is practically possible.

The seventh criterium is to analyse the support of the supplier after delivery. Some of the factors are the following:

- will the personnel of the user be trained and at what cost?

- will the user obtain the new versions of the package and at what conditions?
- will the sale and/or distribution of information produced using the software package be in any way restricted by the supplier?

The analysis may be easier to perform when there are other users of the software package.

The eighth criterium is to analyse whether the package under consideration is capable of receiving and emitting information in a standardized form. If not, cost of producing appropriate converters and additional cost caused by their use must be estimated. If the conversion of some essential part of the data is entirely impossible, the package should be disqualified.

The recommendations of UNESCO [Background paper] advocate also that - inter alia:

- the package be functionally compatible and, to the extent possible, end-user compatible with packages already in wide use in developing countries such as CDS/ISIS and MINISIS [Valantin]
- the package should support various character sets
- the package should support connection to external on-line information retrieval systems, including assistance in log-in and log-off procedures
- the package should have the ability to transfer search results from the on-line system to a local database.

The weight of different criteria, as it was pointed out at the beginning of this chapter depends on the decision of the system planner or manager. In most cases a compromise must be found as there exist in practice no "ideal" software packages. Hence, the ordering of criteria does not necessarily reflect their "universal" importance.

8.2. Procedure of selection

The first step in the procedure is the determination of needs of the focal point for computerized facilities. In subchapter 6.2. main tasks of a focal point were discussed and the jobs viable for computerized processing were briefly characterized. If some functions of the focal point are already operative in non-computerized version the flow of information must be analyzed and the changes in it must be spotted. If some activities are already computerized it must be found out how the old and newly computerized activities will interact. It is also necessary to determine the interaction between computerized and non-computerized areas.

The second step is to prepare detailed specification of the system i.e. to list all what the computerized system is expected to do, point out the relative importance of various features required. The specification should also determine the future development of the system, i.e. the directions into which the system will evolve after termination of the actual project. The preparation of specifications may be to some extent facilitated by taking into account some fixed parameters like (existing) computer installation, limitation in budget, manpower, space etc. In other words, the specification of the system should be as realistic as possible.

The third step is gathering the information on existing software packages. Besides vendor's brochures, which are often misleading sources, the following regular sources can be recommended:

- [LTR],
- [ARIST],
- [Anerback]
- [DATAPRO]

Also [Keren,Sered], on which this subchapter is based is highly recommended.

At this point, using the criteria listed in the preceding subchapter and the specification from the preceding step, which determine the weights or criteria, all packages which do not fulfill highly weighted criteria and/or some details of specification should be rejected. If there was no package left, one must return to step two and modify the specification. If there are too many packages left, more information must be gathered until no more than 5-10 packages survive.

The fourth step is to solicite bids from selected vendors in the basis of actual specification of the systems.

The fifth step is the evaluation of bids. Important source of information are current users of the package. It is advisable visit such users, specially in the context of criterium seven. Also the demonstration of the package in local site is recommend and if the other users have not been contacted or the system is very new, the local demonstration is a must.

In the sixth step, possibly with further reduced group of packages, the final decision must be made, and the contract negotiated. [Keren,Sered] enumerate the following important contract elements:

" - a system description itemizing all hardware and software
- specification of documentation to be supplied and provisions for updating it
- options for user training and guidance (e.g. courses provided by the vendor at the acquirer's location or elsewhere)
- a timetable for delivery and installation, with provision for holding back part of the payment until delivery is complete
- stipulation of the site preparations necessary prior to installation (it is generally the buyer's responsibility to carry out the site preparation)
- terms of payment, specifying the amounts due at the time of

order, on delivery and on final acceptance; preferably, the bulk of the payment should be made only on acceptance, and at least 25% should be held back till then

- acceptance plan, laying out the procedures by which the acquirer decides whether or not the installed system is adequate
- warranty
- hardware and software maintenance, possibly including provision for upgraded versions of the software to be delivered to the acquirer
- provisions for changing or renegotiating the contract
- acquirer's right to sell or modify the system. "

8.3. Tuning the software to the application

Software packages in most cases must be tuned to specific application, i.e. there is a fixed number of parameters and varying number of data which must be specified by system user. In small tailored application packages the number of parameters is rather small and often additional data are not used at all. In general packages (see 8.1) tuning the system to particular application may be a difficult task. For example, the definition of the database and record structure in a very formalized language may be the task of system administrator: some software packages may require a dictionary or a thesaurus or a classification or coding tables which must be prepared by system user and fed into computer by system administrator.

It is true that the first tuning will be usually performed by the supplier of the package. Nevertheless, it is necessary to have own highly qualified system administrator on site which adjust the system according to changes in the workload, number of users, database size and internal terminology (if the package does not update the terminology automatically). Hence, if such highly qualified

personnel is scarce then very simple and specialized packages should be required. For very general packages the tuning may require the work of several man-months.

8.4. Software policy

For an institution of not very big size and moderate needs for information processing, as most national focal points are expected to be "software policy" are perhaps too big words. Nevertheless, some general recommendations can be made:

- the choice of software packages should be made under coordination of INTIB to secure the maximum compatibility of information products and to simplify the training of system managers, database managers and end users,
- for typical information and library applications specialized packages should be acquired,
- for keeping and processing of local files and small databases (see 6.2.1., 6.2.2., 6.2.5 and 6.2.6) one general package should be acquired and a training course in package tuning should be organized,
- the shift in hardware from 8 bit to 16 bit microcomputers with extendible RAM memory [Chen] must be taken in the account in the choice of software.

8.5. Maintenance and development

During the normal exploitation of the system new needs from the users of national focal point will arise. There will be also some feedback from the users, which will often criticize some aspects of computerized services. There will be also some statistical material revealing some bottle-necks and inconvenience in information processing. Some of these shortcoming can be overcome by in-

troducing new values of parameters, correcting errors which were found in the software packages, changing some programs or adding new programs to the package. All this actions are of local interest (except errors which should be communicated to the supplier/vendor and other users of the same software package known to the national focal point) and should be undertaken by the local personnel which should be properly qualified to do the job maintain the performance of the software package at acceptable level.

The most important principle in maintaining the software package is to document every simple change, correction and augmentation. It is absolutely necessary that the documentation is in full compliance with the package actually used. Otherwise, e.g. in case of loosing an employee, the management will be totally at sea. Another must is retaining all former versions of the package or having the possibility to restore them. Taking into account the expected size of computer centre the number of programers maintaining the pckage should vary from 2 (for organizational reasons) for small microcomputer installation to 4 for bigger minicomputer installation with many software packages to maintain. It does not mean that the software maintenance will take all their time, they can and should perform also other jobs. The develo- nt of the used software package or creating a new one is rather r ecommended to be one of the national focal points responsibilities. Nevertheless, if the circumstances allow to expect good quality of the product, UNIDI/INTIB might encourage such activity at some points.

9. Industrial and technological service center at national level

The aim of this chapter is to focus the attention on the problems concerning individual center. As it follows from chapters 1 - 6 and some remarks in chapter 8 there is a great variety of tasks into which national focal point may be involved. There may be also numerous users and institutions in the country and abroad with whom focal point has to cooperate so as to achieve its goals. For example, the institutions may be the following:

- big industrial companies and their research/information centers
- small industries
- governmental legislative bodies
- Statistical Office
- Patent Office
- universities and research institutes
- governmental agencies such as ministry of trade and industry, Customs Office
- Information Centers, libraries and archives
- suppliers of (industrial and technological) information on international market
- other national focal points in the region and INTIB etc.

It is not recommended for the national focal point to be the immediate supplier of big amounts of information extracted from large data bases. Its role should be, in authors' opinion, mainly in facilitating the access of the users to information they need, mainly through referral service and contacting with expert teams; some of factual data from local environment as well as data obtained from international level should be passed directly to the user. This is to avoid duplication of efforts and unnecessary competition with other information units in the situation of very

limited resources.

The first step in planning the activities of national focal point is to analyze existing resources, identify the partners and potential users, determine their needs and evaluate the means to fulfill them.

To enable the analysis, several surveys and directories must be consulted or prepared when they are nonexistent, which is often the case in developing countries. Such surveys include:

- survey of industrial facilities in the country [Survey]
- inventory of information centers, libraries and archives (e.g. in the form recommended by [Vilentchuk])
- directories of the institutions listed at the beginning of this chapter
- assessment of telecommunication facilities (e.g. [Battu,Rose])
- assessment of computer facilities (e.g. [Koerner]).

The second step is the analysis of potential users needs, based on the first step (see also chapter 2).

The third step is based on the results of the second step and consists of the analysis of availability of external sources of information potential to centre's users needs.
Several directories may be consulted, e.g. [DIALOG], [Hall,Brown].
If on-line access is not possible for financial or technical reasons then the organization of a surrogate service, e.g. SDI should be considered at least for the most important country's industries.

The fourth step should be the feasibility study, based on the results of the former steps and indicating the actions possible for creating or upgrading the services of national focal point.

An important factor to be taken into account while designing or redesigning the focal point is the availability of appropriate personnel. Appropriate assignment of personnel responsibilities is of vital importance. When a medium-size computing center is planned to

be installed at a focal point, the staff for the following posts is needed [Janssens]:

- system manager; he has to control the system performance and the distribution of the system resources between the different applications. He should be also responsible for the system jobs, the system security, the start-ups and shut-downs of the system and the follow up on system failures,
- operations manager; he is responsible for scheduling the jobs to be done and controlling that they are performed according to schedule,
- database manager for each existing application (one person may be the manager of several applications); he is responsible for maintenance of the corresponding databases and the creation, maintenance and launching of corresponding jobs,
- operator; he is responsible for console operations and distribution of printed results,
- maintenance and service technician.

The lack of staff for these posts or unclear assignment of these responsibilities may result in dramatic decline of center productivity. When the smaller scale of computerization is assumed, some problems can be simplified. For instance, many microcomputers need no regular technical service and maintenance; after some training of the users they may be their own operators and database managers; functions and responsibilities of system and operations managers may be considerably reduced. Nevertheless, the existence of these functions and respon sibilities must be recognized by system designer or redesigner of a focal point having a computer facility.

In planning the activities of a focal point the coordinating role of INTIB should be taken into account and its activities [de Mautort] should be used for benefit of the focal point.

10. Networking

The information which is relevant to industrial user is very often dispersed in many places within country and abroad. To make accessing of this information possible for industrial user various strategies may be adopted. One of them, and the most promising one, is the network concept (see chapter 5.4). The basis of the network concept is the idea that every participant of the network has access to its information resources regardless the place where they are physically stored and maintained. The network consists of nodes and communication channels. The information is stored and processed at nodes and communication channels are used for transmission of messages between nodes. The messages may contain queries, answers to them and others signals needed for cooperation of nodes. The nodes may be essentially of two types, the ones that have no or little information resources (and do not share it with the others nodes) and the ones that can share the resources. The first are usually called ("dumb") terminals and the term "node" is reserved for the second type. The price for the benefits of network organization is the necessity of abiding the common rules in all parts of the network. The set of rules which must be abeyed in the network of a given type is called protocol. Normally, the higher degree of automation of the operations in the network the more sophisticated protocols must be used. The ISO Reference Model for Open System Interconnection ISO/TC97/SC16 N227 gives the general frames of organization of interconnections in the network.

The model consists of seven layers arranged hierarchically. At each node appropriate interfaces between layers must be secured (in both directions) so that the network be "transparent" to application programs.

The first layer is the physical layer. In that layer the transmission really takes place (streams of bits are transmitted between nodes) and the protocol in that layer must precise all parameters of the channel and transmitting device that secure the compatibility in the process of transmission (e.g. electrical, logical etc.).

The second layer is the data link layer. The necessity of this layer is the consequence of non-ideal character of physical channels, viz. the noise in these channels causes errors in transmission. In the second layer the unified error detecting and correcting codes as well as recovery procedures must be defined. At this layer the transmission can be considered reliable (with a certain probability).

The third layer is the network layer. Here the details concerning routing and congestion in the network are defined. The CCITT X.25 protocol is an example of network layer protocol.

The fourth layer is the transport layer. This layer is responsible for reliable host to host communication. Due to the results of this layer the processes on higher (user) layers are freed from the details of data transmission and network management.

The fifth layer is the session layer. This layer is responsible for process to process communications (whenever necessary) and uses the facilities of the transport layer.

The sixth layer is the presentation layer. It is responsible for unifying the codes of data, data structures etc. used at cooperating nodes.

The seventh layer is the application layer. It is responsible for unifying the semantics of data used at the cooperating nodes. At this level the transparency of application programs is secured.

Each layer with higher number uses the results of the layer of lower number.

As it is pointed out by [Lancaster, Smith] the ISO Reference Model for Open System Interconnection says nothing specific about the implementation of these protocols. Instead, it serves as a framework for describing layered networks by specifying each layer - its purpose, the services provided to the next higher layer, and the functions performed. Although it is not a protocol standard, it does suggest places where protocol standards could be developed. The main idea of "layering" the protocols is to make the protocol at a given layer independent from the details of lower layer implementation.

As the discussion in the preceding chapter shows, there is no immediate need for building a vast node of computer network at the national focal point. There is no justification in size of local databases or volume of data transferred to join an existing computer network let alone design one.

In developing countries, where there are difficulties with telecommunication systems and powerful enough (to play the role of a host at the node) computers are scarce the computer network in the sense described above seems to be the song of the future. It does not mean that national focal points cannot benefit from existing computer networks or to introduce some network concepts into the process of stepwise refinement and upgrading of focal point's services. One step in this direction may be using the mini- or microcomputer at the focal point as an intelligent terminal for searching in the databases accessible through existing computer networks. In such a case only one long hand link is needed and obtaining it can be in many cases quite realistic. It is needless to say that the terminal must conform to the protocols of the particular network.

Before explaining the other step that is possibie, let us note that even though the ISO Reference Model for Open System Interconnection was stimulated by the development in the telecommunication

and computer technology, it does not specify that the messages between nodes must be transmitted via telecommunication system.

Hence, to secure the compatibility between the focal points and INTIB headquaters at Vienna it is advisable to agree a presentation layer protocol and an application layer protocol. Speaking less formally, an initial step of organization of INTIB "computerized network" may be described as follows:

- a microcomputer with characteristics similar to IBM PC with more than 512KB memory, 2x360KB diskette drives, 1 hard disc 10MB and a printer are installed in all focal points participating in the network
- a common format for data presentation is adopted (e.g. CDS-ISIS format)
- a common software for data retrieval and maintenance is adopted (e.g. MICRO-ISIS developed by UNESCO)
- diskettes are used as data echange carrier i.e. the diskettes with new data compiled at UNIDO are sent to all focal points participating in the network and the data collected by the focal points and recorded on diskettes are sent to UNIDO.

While the circumstances allow the sending of diskettes may be replaced by dedicated connection and further by a commuted one.

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Appendix 1

Excerpts from: /small firm/

INTERVIEW RECORD SHEET

These sheets were used only by the interviewer, and were not intended as a questionnaire for distribution. The sheets that follow have been slightly condensed and white space omitted, but notes to guide the interviewer have been retained. Questions were usually more specific than the headings indicated here, and referred to actual organisations within each area. The sheets therefore acted as a prompt in order to explore information situations relevant to the firm.

Name of business
Address
Phone No.
Name of person(s) interviewed
Products (description)

Is person owner or founder
Present position of interviewee
Background, previous experience, jobs
Age (approx.)
Sex
Formal education (school leaver, further ed., grad., post-grad.)
Other qualifications, training, appenticeship
Business training at any level
Motivation/reason for starting business
Previously redundant/unemployed
General attitude to external help
Ability to communicate (give your view, with comment)
Indicate personal factors which appear to influence use of information

Status of firm (sole trader, ltd. etc.)
Size, no. of employees, including outworkers
Date established
Other branches, related firms
Apparent growth stage (growth, decline, etc. either as perceived by firm, or as deduced)
Product group
Study area
Location type (inner city, new town, etc.)
Site type (industrial estate, workshops, alone, etc.)
Landlord, type of lease, grants, special schemes
Relocation, expansion plans
Source of premises information
Market range (<25 miles, region, UK etc.)
Amount of exports (approx. %)
Use of mini-computers (in use, planned, etc.)
Managerial functions within firm, excluding owner/founder
Other features of firm of possible relevance, e.g. links with large firms

Approximate length of interview
Response to interview (enthusiastic, analytical, cautious, etc.)
Selection of firm, how contacted
Prospects for further contact
Provision of test guide, response

CHECKLIST OF BASIC SITUATIONS

Before asking specific questions find topics which are relevant to the firm, and likely to provide suitable answers. This check list covers the main topics and each should be mentioned to determine its relevance. Indicate topics which represent problem situations.

PRODUCTS, design, development, innovation, testing, standards
PRODUCTION, processes, equipment, automation, maintenance
PREMISES, moving, renting, planning, expansion, regulations
STAFF, recruitment, training, legislation
MARKETS, market research, competitors, expansion, selling, customers
FINANCE, bank, other sources, grants, special assistance
EXPORTING, markets, credit assistance, documentation
EEC, regulations, markets for sales
LEGISLATION, tax, VAT, regulations, restrictions, forms
MANAGEMENT, systems, administration, budgets, bookkeeping

Other topics will be raised by the firm, and should be noted. It will be found that there is a greater need for new information from outside the firm at certain critical stages, which often occur at growth points in the firms development. Identify such situations, e.g.

Start-up of the firm
Employing first member of staff
First large order, relative to previous trading
Move to new premises
Purchase or lease of major new equipment
First export order
Starting a new product line

BASIC QUESTIONS

Questions must vary, depending on the type of information situation being discussed, but use the following as a suggested format.

What type of information was needed?
To what extent was the information available within the firm?
What information was sought outside the firm?
Did you approach existing, known contacts?
Or did you have to make new contacts?
How did you find out who/where to contact?
Were contacts local/regional/national/overseas?
How was contact made - phone, letter, visit?
How was information received - phone, visit, publication, etc.?
Under what circumstances do you pay for information?
Do you tend to keep up-to-date through reading, personal contact, or other means?
What are your comments, feelings, reactions to the information received, and the contact made?

CONTACTS

All questions are aimed at determining contacts, sources of information and general awareness. Try to indicate specific contacts which were made for a special purpose, and regular contacts which contribute to general awareness. Also indicate sources of literature, such as journals, which contribute to general awareness.

Basic Professional and Bank Services

Bank, name, type, location, use made
Accountant, type, location, use made
Solicitor, lawyer

Customers, Suppliers, Professional and Commercial Services

Indicate type of contacts, how the firm values the contacts, quoting specific instances where possible, problems, successes. Prompt, if necessary, suggesting specific names but do not run through lengthy lists of possible sources of information.

Customers
Suppliers
Competitors
Other business contacts, local or elsewhere
Representatives
Buyers
Advisory/counsellor services (small firms)
Development agencies
Local authority departments/ industrial development officer
Educational establishments/industrial liaison units
Management consultants
Credit information services
Architects
Consulting engineers
Surveyors
Insurance agents
Factoring services
Advertising/publicity agencies
Printers
Market research

Membership of Organisations

What trade or professional organisations, institutes, etc. does the firm and the individual belong to, and what benefits are derived?

Trade associations, local, national
Chambers of commerce
Professional institutions
Small Business Clubs
Political or other lobby type organisations
Research organisatins
Information or library services
Rotary, golf or other similar clubs

Training, Courses, Conferences

Does the firm send staff or management to any outside organisation for the purpose of training, keeping up to date, etc? (give as much detail as possible, where relevant, including difficulty of finding out, relevance to the firm, etc.)

Short courses, workshops
Seminars, conferences
Starting up in business courses/MSC etc.
Industrial Training Boards
College/University courses
Other business courses

Marketing/Selling

Does the firm use any of the following? - give details, including usefulness, cost, frequency, effect on sales, etc.

Exhibitions, trade shows
Craft, design centres
Entries in directories, yellow pages, special guides
Overseas missions, exhibitions, etc.

READING/LITERATURE SOURCES

Try to seek specific examples of how the firm/manager uses literature and publications, including library services, both for general awareness, and to find specific information. Also record an indication of the kind of literature visible in the office or firm, in terms of type of data received.

Trade journals
Specialist journals
Reference books, directories
Text books
Product literature
Yellow pages, or similar
Newsletters, bulletins
Local papers
Guides to information sources
Special commercial information services
Library services

Does he have problems obtaining or understanding literature sent to him? Does he get too much or not enough? Is there any kind of filing system? Has anything on radio or TV had some effect on his business or his ideas? To what extent does he pay for information now, and what is his attitude to this?

GAPS OR DEFICIENCIES IN FLOW OF INFORMATION

(Note: This section is probably best completed shortly ater the interview, but the questions need to be considered at all stages of the interview.)

Is there a contact/publication/source of information which could be relevant to his needs, but which he is unaware of?

What is his reaction when told of this possible source of information?

Can you find cases where he is aware of possible contacts/sources of information, but has not taken further action? Why not?

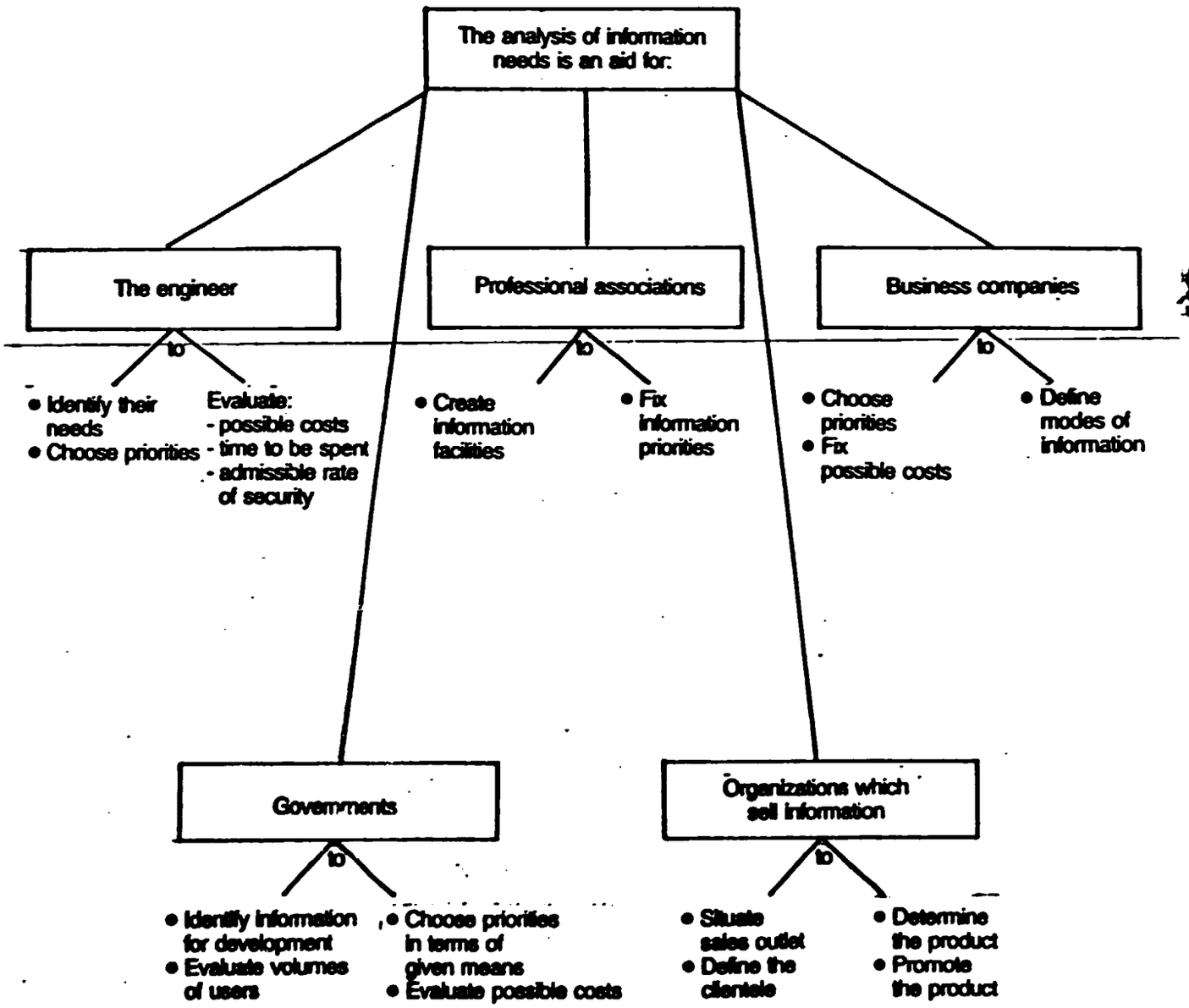
Can you find cases where he has made contact or taken some positive action, but he did not get the help he expected, or some other reaction which led to a negative effect?

What are his comments/feelings when he does not get the reaction/ information he wants?

In the light of your knowledge of sources of information, do you feel the subject's comments are fair and could reasonably apply to other firms also, or do you feel that the subject himself was largely to blame or responsible for not getting better results?

Appendix 2

- USEFULNESS OF THE ANALYSIS OF INFORMATION NEEDS *



*Excerpted from: identifying needs

Appendix 3

Excerpted from: [Chico]

TECHNONET ASIA (Asian Network for Industrial Technology Information and Extension)

TECHNONET ASIA is a cooperative grouping ("network") of Participating Organizations in ten Asian-Pacific countries, which aims at improving the quality and efficiency of production in those countries' small and medium scale industrial enterprises. Particular emphasis is given to the application of knowledge concerning known processes, methods, techniques, equipment, modifications and approaches to existing operations, effected by the transfer of technical information and provision of industrial extension services.

The countries and organizations involved are the following:

Bangladesh	Bangladesh Small and Cottage Industries Corporation (BSCIC)
Fiji	Fiji National Training Council (FNTC)
Hong Kong	The Hong Kong Productivity Centre (HKPC)
Indonesia	Direktorat Jenderal Industri Kecil, Departemen Perindustrian (Directorate General for Small Industries, Ministry of Industry) (DP/DJIK)
Korea	Korea Scientific and Technological Information Center (KORSTIC)
	Small and Medium Industry Promotion Corporation (SMC)
Malaysia	Standards and Industrial Research Institue of Malaysia (SIRIM)
	Majlis Amanah Ra,ayat (MARA)
	(Council of Trust for Indigenous People)
Philippines	Institute for Small-Scale Industries, University of the Philippines (UP ISSI)

	Economic Development Foundation (EDF)
Singapore	Singapore Institute of Standards and Industrial Research (SISIR)
Sri Lanka	Industrial Development Board (IDB)
Thailand	Department of Industrial Promotion, Ministry of Industry (DIP)

The network started as a project when, in 1973, the International Development Research Centre (IDRC) of Canada agreed to provide core and program support for a period of five years. It brought together eight organization in ten Asian countries - later expanded to the present thirteen organizations in ten Asian-Pacific countries - into a network for industrial technology information and extension sercices. Spurred by the success of its programs, the organization has been registered as an official and legal entity in January 1980. Beginning in 1980, the Canadian International Development Agency (CIDA), through its Industrial Cooperation Division, has assumed a major role in supporting TECHNONET ASIA. IDRC, however, continues to support a substancial portion of the organization's 1980-1983 budget.

In addition, Participating Organizations make annual contributions to TECHNONET and provide counterpart support in its activities. The assistance of other donor agencies and international organizations have also been sought on specific projects, notably that of the Japan International Cooperation Agency (JICA) which has provided funds and expertise for a joint research on the small and medium scale metalworking industries and other related activities. Several joint activities have also been undertaken with the United Nations Industrial Development Organization (UNIDO). TECHNONET also has links with some sixty other cooperating institutions worldwide.

TECHNONET Centre, located in Singapore, has been set up to act as the focal point for the network. It is headed by an Executive Director selected from one of the Participating Organizations. The heads of the Participating Organizations, together with the Executive Director, comprise a Council which meets at least once a year and concerns itself with policy aspects.

The main activities of TECHNONET include:

- Organizing and conducting the appropriate training of industrial extension officers;

- Holding regional meetings of extension officers to exchange experiences, learn new skills and strengten the spirit of fellowship and promote recognition of industrial extension as a profession;

- Strengthening industrial (technical) information services with the aim of the network becoming more self-reliant through "direct networking" among Participating Organizations;

- Promoting the exchange of technical enquiries among Participating Organizations by direct networking and referral to other specialized technical information sources through TECHNONET Centre in Singapore;

- Establishing links with specialized technical information sources;

- Facilitating the interchange of extension and information personnel;

- Facilitating communication among extension officers through the TECHNONET "Newsletter" and "Digest";

- Supporting state-of-the-art reviews of particular sectors of industry as and when appropriate;

- Providing Current Awareness Services;

- Sponsoring the production of pamphlets, films and other audio-visual products useful to the extension worker;

- Facilitating the transfer and sharing of appropriate technologies;

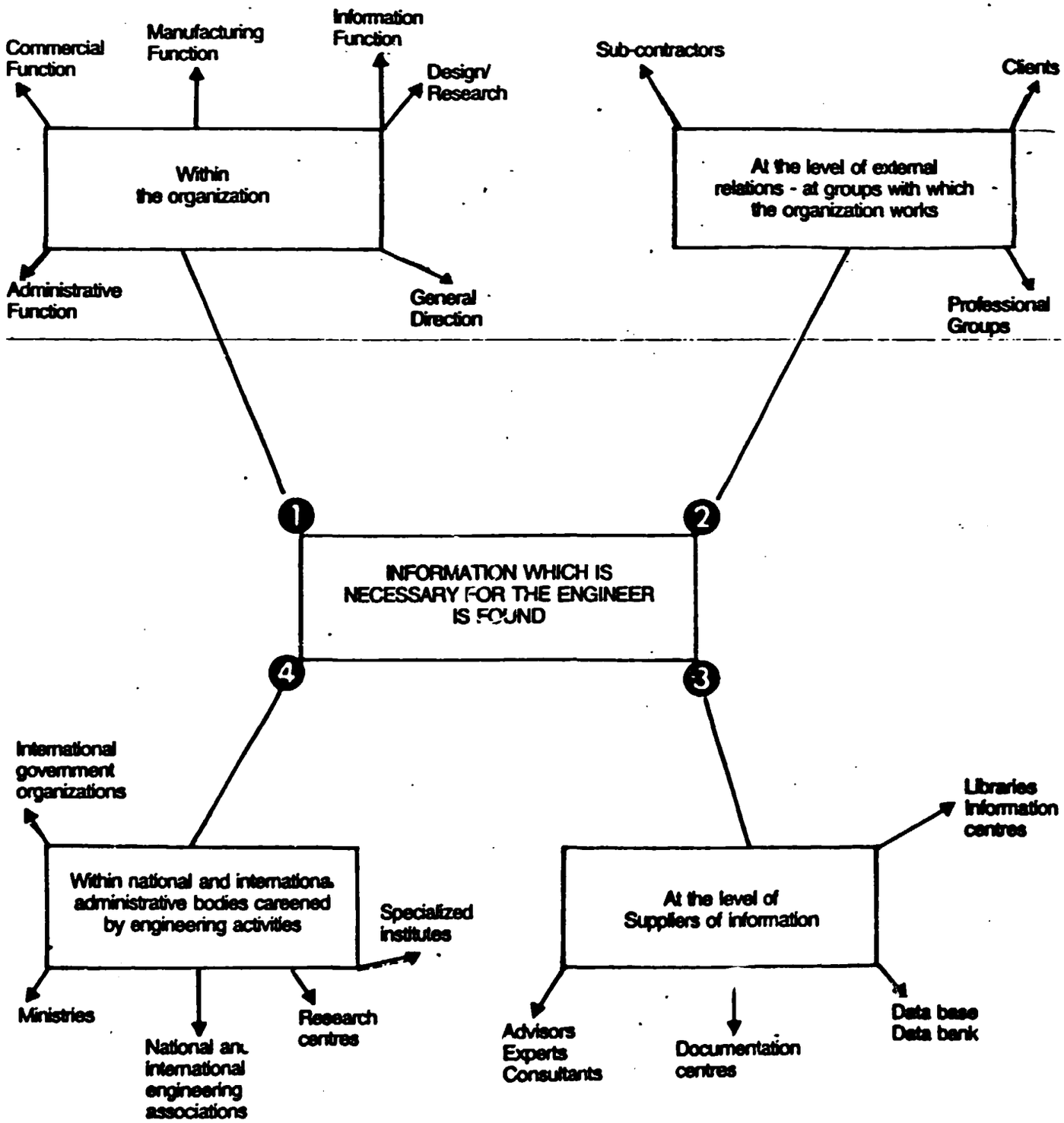
- Assisting in the promotion of entrepreneurship and the establishment of new industries;

- Assisting indigenous entrepreneurs engaged in new industries and facilitating joint ventures.

TECHNONET ASIA has hour major program areas: Technical Information, Industrial Extension, Technology Transfer, and Entrepreneurship - a "total approach" of assistance to industry. With the expertise made available through TECHNONET ASIA since its inception in 1973, much improved technical information services for small and medium scale industry have been established in the TECHNONET network which now has computerized services in three Participating Organizations. Further, the network is seeking more effective ways of facilitating the flow of technical information for industry, of Asian origin, between Participating Organizations and other interested regional bodies.

Appendix 4

WHERE IS THE ENFORMATION?*



* Excerpted from: identifying needs

Typical mini- and microcomputer configurations

Type	Wordlength	Main Memory Mass storage	Input device	Output device	Terminals	Operating System
PRIME 550	16 bit	64KB-480KB Disc drives 10MB 1 unit- 250MB Tape drive Max 4	Keyboards with VDU	Printers (unlimited) VDU	1-30	PRIMOS
VAX 11/730	32 bit	1MB Disc drive one unit Tape drive none	Keyboards with VDU	Printers VDU	1-96	VMS 3.0
PDP 11/24	16 bit	64KW extendable Disc drive: 1 unit 80MB extendable Tape drive 1	Keyboards with VDU	Printers VDU	1-12	RSX 11M
HP 3000	16 bit	256KB-8MB Disc drives: 1 unit 27MB extendable to 404 MB (8 units) Tape drive 800,1600 and 6260bpi	Keyboards with VDU	Printers (unlimited) VDU	1-64	MPE IV

APPLE II+	8 bit	64KB Disc drives: 2 floppy 130KB up to 8 20MB hard	Keyboard with VDU	VDU Printer (Max 1)	-	UCSD PASCAL
Commodore CBM 8032	8 bit	32KB Disc drive: 500KB floppy	Keyboards with VDU	1 Printer VDU	-	Commodore
IBM PC/XT	16 bit	128KB-640KB Disc drives: 2 units 320/360 KB, floppy up to 2 units 10MB hard	Keyboard with VDU	1 Printer VDU	-	DOS 2.0
SUPERBRAIN	8 bit	64K Disc drives: 1 unit 5MB up to 80MB Tape drive: backup	Keyboard VDU	VDU	-	CP/M
Radio Shack TRS 80 model II	8 bit	min 64K Disc drives min 500KB floppy or 5MB hard disc	Keyboard with VDU	1 Printer VDU	-	TRS DOS CP/M

Appendix 6

Excerpted from: [Guinchat, Menou]

Definitions of the main types of documents

Book - a set of printed pages brought together to form a paper back or bound volume,

Document - an aggregate of an information carrier, the data recorded thereon or therein and their meaning, used for consultation, study, testimony,

Monograph - a self-contained work, in one or several volumes, published either as a single unit or over a predeterminated limited period of time,

Periodical - a publication, normally by several authors, recognized by law in certain countries, appearing usually at regular intervals fixed in advance, whose successive instalment, generally including a contents page, are chronologically and serially linked for a period of time initially unlimited,

Report - a document setting out the results of a study or piece of research,

Series - a publication intended to be continued indefinitely, generally issued by one or several bodies, and not necessarily appearing at fixed intervals,

State-of-the-art - a report on the present state of a subject or field drawn up by evaluating the relevant literature over a given period of time,

Thesis - research submitted to a faculty to quality for a university degree.

A national bibliography record supplied as a catalogue card:

From the British Library BNB Card Service

The ILLUSTRATED history of British railways / foreword by Sir Peter Parker / consultant editors Geoffrey Freeman Allen and Patrick Whitehouse. - London : Arthur Barker, c1981. - 224p : ill(some col.), maps(some col.),coats of arms(some col.),facsims(some col.),ports ; 25x32cm
Includes index
ISBN 0-213-16811-1 : £12.95

1.Allen, Geoffrey Freeman 2.Whitehouse, Patrick B.
385'.0941 DC18: 385'.0941

(B82-02437)

2086 - 2

Records from printed national bibliographies:

From *Fiji national bibliography* 1981: covering publications from 1970-1981

372.6591431 F81.163
CHANDRA, Ami.
Hindi ki panchvi pothi / Ami Chandra. - Rev. ed. - Suva : Indian Printing and Publishing Co. Ltd., 1967.

16p. : ill. ; 19cm.

1. Hindi language - Readers.
2. Hindi language - Study and teaching - Fiji Islands.
I. Title.

372.6591431 F81.164
FIJI. Ministry of Education.
Navin Fiji reader : dusra bhag / edited by Shiu Prasad. - Suva : Indian Printing and Publishing Co. Ltd., 1972.

70p. : ill. ; 25cm.

Cover title.

1. Hindi language - Readers.
2. Hindi language - Study and teaching - Fiji Islands.
I. Prasad, Shiu. II. Title.

996. F81.334
TUPOUNIUA, Sione,
The Pacific way : social issues in national development / edited by Sione Tupouniua, Ron Crocombe, Claire Slatter. - Suva : South Pacific Social Sciences Association, 1975.

253p. ; 20cm.

Includes bibliographical references.

1. Oceania - Social life and customs. 2. Oceania - social conditions. I.Crocombe, Ronald Gordon, jt. ed.
II. Slatter, Claire, jt. ed.
III. South Pacific Social Sciences Association. IV.Title.

996.11 F81.339
RABUKAWAQA, Joshua R.
Bau : a brief description of historical features found on the island of Bau / (Joshua R. Rabukawaqa). - (Suva? : s.n.), 1980.

15p. : ill. ; 21cm.

1. Bau Island - History.
I. Title.

NB: No square brackets available on typewriter keyboard

Excerpted from: Manual

Appendix 8

Sample of exteńded classified schedules included in the national bibliography :

From *Bibliografi Negara Malaysia* 1978

Dewey Decimal Classification Edition 18

Schedules: History

Perluasan bagi Malaysia (Expansion for Malaysia)

959.5 *Malaysia

.503 Early and modern history to 1945

.5031 Early history to 1800

.5032 Modern history, 1800-1946

.504 Middle 20th century, 1946-1963

.505 Federation, 1963-
Class separation of Singapore, 1965 in 595.57

.5051 Prime Ministership of Tunku Abdul Rahman Putra, 1963-1970
Including Indonesian confrontation

.5052 Prime Ministership of Tun Abdul Razak Hussein, 1971-1976

.5053 Prime Ministership of Datuk Hussein Onn, 1976-

959.51 *Malaya
Class History of Singapore in 959.57

.5102 Early period to 1511-1786
Including Malacca Sultanate

.5103 Malay States and foreign powers, 1511-1867
Including Siamese influence

.51031 Early period, 1511-1786

.51032 Later period, 1786-1867

.5104 Malay States and Britain, 1867-1942
Including Straits Settlements, Federated Malay States, Unfederated Malay States

.5105 Japanese occupation, 1942-1945

.5106 British rule, 1945-1957
Class here Malayan Union; 1946; Emergency, 1948-1960

.5107 Federation of Malaya, 1957-1963

.5108 Federation of Malaysia, 1963-

959.521 *Sabah

959.522 *Sarawak

959.55 *Brunei protectorate

959.57 *Singapore
Including separation of Singapore, 1965

*Add as instructed under 930-990

Appendix. Example of an abstract of a document

Original title

J. G. Tschinkel and H. Tschinkel
Contribution to the conservation of ligneous fuels: performance and fuel-saving properties of four types of cooking stove. 21 pp.

Author's abstract

In several arid regions, the destruction of plant cover owing to the need for firewood and charcoal has reached alarming proportions and incited governments to encourage the use of gas and paraffin rather than ligneous fuels. To permit a rational choice of the most suitable type of cooking-stove for rural areas, four types of cooking-stove using burners were tested under laboratory conditions: (1) a pressurized paraffin stove, (2) and adjustable wick oil stove, (3) a fixed wick oil stove, (4) a propane or butane gas ring. The amount of fuel consumed, the maximum amount of heat produced, flame adjustability and actual performance were compared. The pressurized paraffin stove proved superior on almost all counts; although the gas ring produced a similar amount of heat, the pressurized paraffin stove is more economical owing to the high cost of propane gas in Tunisia.

Abstract composed of descriptors

Economy. Forest

Study on/Domestic economy/in/Rural areas/. Comparison of four types of stove for the/Cooking/of food, concluding in favour of the/Paraffin/stove.

Study contributing to the/Forest conservation/by avoiding the use of/Firewood/and hence the destruction of/Plant cover/.

Indicative abstract

Comparative study of the physical and fuel-saving properties of four types of oil and gas cooking-stove suitable for rural areas in Tunisia.

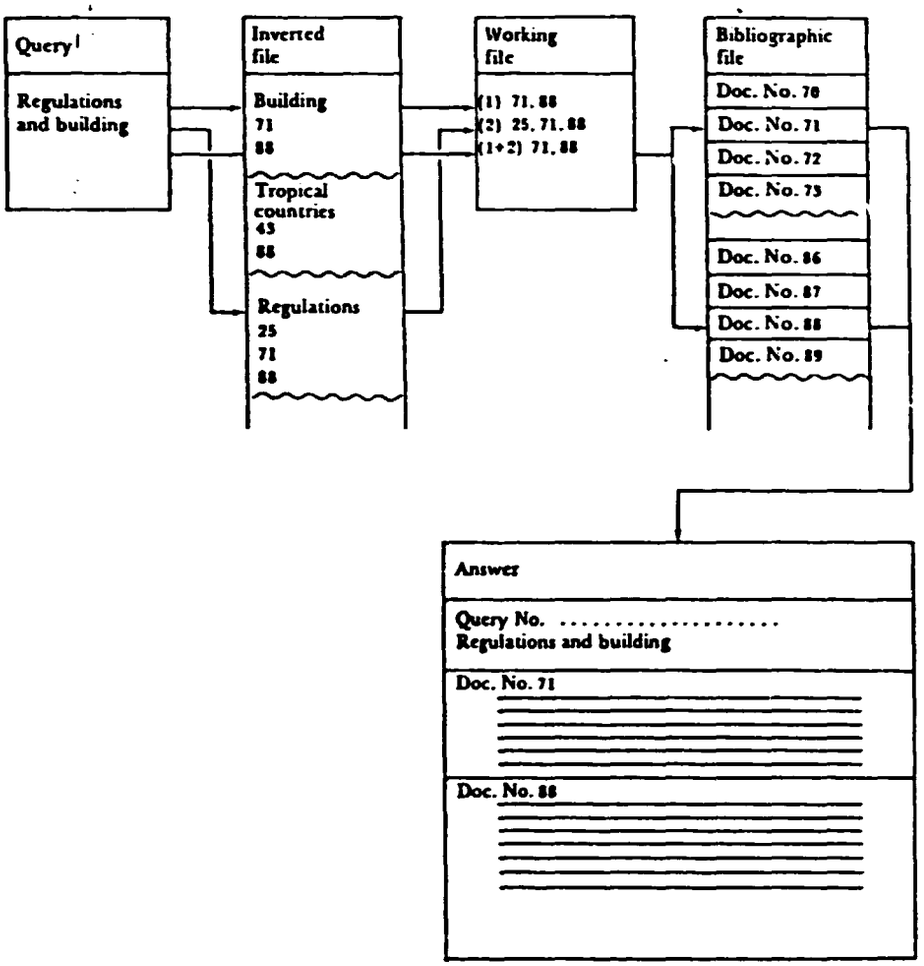
Informative abstract

Comparative study under laboratory conditions of a pressurized paraffin stove, an adjustable-wick oil-stove, a fixed-wick oil-stove and a propane or butane gas ring in regard to fuel-saving properties, maximum heat produced, flame adjustability and performance characteristics. Owing to the cost of propane gas in Tunisia, the pressurized paraffin stove is the most economical. Its performance is superior.

The use of this source of heat in rural areas would reduce destruction of the plant cover.

Excerpted from: Guinchat, Menou

Appendix 10



. Search by means of an inverted file.

Excerpted from: Guinchat, Menou