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ABSTRACT

The symposium was arranged for the purpose of collecting, discussing and selecting ideas and experience to assist information services and their users in ensuring a more effective transfer and utilization of the flow of information. The report presents the rationale of the program, the opening address and the introductory address and digested versions of papers divided into four chapters. These include: Information and the Enterprise, Users of Information, Information Activities at the National Level and International Cooperation in the Field of Information. Appendices include a complete list of submitted papers and a list of those who participated in the discussions of the symposium. (AB)

Symposium on

Communication of Scientific and Technical Information for Industry

21st - 22nd October, 1969, in Rome

Arranged by
FID Study Committee »Information for Industry« (FID/II).

A DIGESTED REPORT

FID 463

FID/II
Ørnevej 30, 2400 Copenhagen NV, Denmark

Preface

This publication signifies a departure from a professional tradition in that it condenses in an extremely selective manner a large number of invited papers.

The FID Study Committee "Information for Industry" (FID/II) has, however, been anxious to present a concise report. The underlying aim is to inspire and promote individual, national and international initiatives in highly industrialized as well as developing countries. The envisaged result should be increased utilization of the knowledge in existence throughout the world thus bringing about economic and social growth.

It is our hope that this publication will be widely read and thus make a contribution towards a closer international understanding and cooperation aimed at a more effective information flow in the interest of the user.

Chairman FID/II

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Editorial Comments

The symposium on "Communication of Scientific and Technical Information for Industry" was arranged by the Study Committee FID/II for the purpose of collecting, discussing and selecting ideas and experience. The aim was to help information services and their users ensure a more effective transfer and utilization of the flow of information.

Under the chairmanship of Mr. Ralph E. McBurney the Study Committee FID/II entrusted Mr. Karel Havlíček with the task of formulating the underlying concept of the symposium and organising the invitations to submit papers. The symposium was planned to be held in connection with an FID Congress in Moscow in 1968.

The symposium had to be postponed and was held in Rome in October, 1969. Here all the papers submitted were discussed by a group of professionals who had undertaken to study the papers in advance of the meeting and take part in the discussions. The purpose of the symposium was to pick out those papers which were regarded as presenting inspirations and lessons of particular value on the long view.

On this basis an editorial committee comprising Mr. Karel Havlíček (Czechoslovakia), Mr. F.G.Halang (Canada), and Mr. Torben Hvidegaard (Denmark) (Secretary of FID/II) has prepared the following digested report. The editorial committee has considered it expedient to divide the papers selected into four chapters. This division deviates from the order of succession in which the papers were presented during the symposium.

Those readers wishing to acquaint themselves with all the papers submitted are referred to the Appendix containing a complete list. Copies of the individual papers can, as long as they are available, be ordered from the General Secretariat of FID. 7, Hofweg, The Hague, Netherlands, the price being 15 FF per paper.

The Appendix also includes a list of those having actively participated in the discussions of the symposium. Some of the statements made during the discussions have been included in the prefatory remarks of the individual digests.

Editorial Committee

Underlying Idea of the Symposium

By KAREL HAVLIČEK

Organizer of the Symposium

The impact of scientific and technological progress on the development of society depends on the use of its achievements in industry. The transfer of scientific and technological knowledge into industrial practice is, therefore, of paramount importance. Scientific and technical information services are important instruments in effecting this transfer.

The International Federation for Documentation (FID) as a world information organization is fully aware of the part it has to play in the sphere of information for industry. This is demonstrated by the activities of the FID Study Committee "Information for Industry" (FID/II).

In organising the symposium on communication of scientific and technical information to industry the Study Committee FID/II attempts to find common features in different analytical and comparative studies of well-proved methods, to achieve a broad exchange of experience and views as well as to expand practical cooperation in seeking effective ways and means.

The Study Committee FID/II invites experienced information officers, scientists specialized in the theory and practice of information, information users capable of formulating their needs, and international organizations with similar programmes to take part in the symposium.

The subject of the symposium is not *how* to provide information for the research worker but the transfer of final research results and equivalent knowledge. Industry does not only need scientific information and information on production technology but also economic and managerial information.

In spite of numerous examples of well-organized information

services for industry, we are still witnessing that a great deal of information supplied to industry is too general and is not satisfying the needs of the various users for specific replies.

Study Committee FID/II expects that the symposium will assist:

- information officers in gaining a better understanding of their position and tasks and drawing conclusions for a new, active policy in their work,
- information users in understanding better the possibilities of exploiting the information services,
- information scientists in concentrating on the main theoretical and methodological problems of effective information service for industry.

Opening Address

By RALPH E. McBURNEY

President FID, Former Chairman FID/II

The FID/II-committee was formed to represent particularly the requirements of the user and it has always concerned itself with the practical aspects of the transfer of information.

This symposium represents a broadening of our efforts to consider the transfer of knowledge to industry.

Other international organizations have also found that the transfer of information is absolutely vital and have accordingly set up sections of their organizations to deal with this aspect.

FID is an organization which has direct access, through its membership, to the majority of experts in the documentation field throughout the world and is therefore expected to perform its function in aiding these large international bodies to improve scientific and technical communication.

Introductory Address

By KJELD KLINTØE

Chairman FID/II

The dynamic evolution within industry is recognized to be the background for further development of societies all over the world.

It is appropriate to develop further ways and means which have proved to be efficient for the transfer in industry of scientific, technical and other advanced knowledge.

It is important to establish a fruitful dialogue between users, mediators, as well as producers of knowledge on how to foster a more progressive exploitation of information within industry.

We have therefore based this symposium upon a number of invited papers aimed at illustrating the present situation in various countries and organizations.

It is the aim of the symposium to establish among a limited number of professionals a discussion and obtain an evaluation of experiences and ideas, and reactions on the papers.

CHAPTER I

Information and the Enterprise

"If an enterprise is to operate at its full potential it must manage its information capabilities as well as it manages its people, its raw materials, its economic planning etc."

KJELD KLINTØE:

SCIENTIFIC AND TECHNICAL INFORMATION AT ENTERPRISE LEVEL *(D.0 (16))*

The Enterprise

Modern society expects an enterprise

- to produce valuable goods and services,
- to make a profit (on which the economic strength of society is dependent),
- to provide employment.

An enterprise only makes a profit because it has an expertise which satisfies the demands of customers within their purchasing power. It only keeps its customers by developing the expertise according to new demands. Development of expertise and recognition of new demands require an information system, which may thus be likened – as to importance and to a certain degree also as to function – to the blood system of a human being.

The growth rate of an enterprise is dependent on the following:

a. investigation of the demands of customers for execution of functions,
b. investigation of the markets (size, purchasing power, etc.),
c. the professional qualifications of the staff,
d. the efficiency of the enterprise (i.e. in economic terms),
e. the capability of the staff to convert scientific and technical progress into products and services.

The Information Policy

An enterprise can only afford to make use of a very limited part of the enormous amount of information available. It must therefore state a policy of information containing the following:

1. *Definition of the concept and the objectives of the enterprise*
   - Competition policy (price or quality?)
   - Manufacturing policy (mass production, serial production, or manufacture of investment goods?)
   - The nature of the market wanted (local, regional or global?)
   - Policy of technological development (to keep pace with development, to keep pace and occasionally lead, or to be in front all the time?)
2. *Description of the nature of information which must be procured*
   - Experience gathered by staff members
   - Information on customers' demands
   - Reports on science and technology, finance, management, organisation, etc.)
   - Literature (journals, primary and secondary).
3. *Description of the organisation of the internal information service*
   - Centralized (with the use of advanced equipment)
   - Centralized-Decentralized (with participation of the staff)
   - Decentralized (making use of the responsibility of individual staff members)

The Information Service

The ideal information service is – in the writer's opinion – a centralized active service, which involves most of the staff members in the procurement and selection of information, and which is attached to top management.

The centralized service has the task of organising the procurement and the internal flow of information which falls into two groups:

a. *Verbal information*
During a professional conversation an enormous amount of information is transmitted due to:
- the very intense involvment in the subject
- the unsurpassed selection of relevant information.

Verbal messages ought to be written down in condensed form for filing purposes.

b. *Written information*
is generally regarded as the most important source of scientific and technical information.

It is, however, necessary to restrict the procurement of material, partly because of the price of the documents themselves, partly because of the costs of reading, evaluation, classification, filing and retrieval. It is often stated that computerized documentation will reduce costs, but it is still only an investment in the assortment of documents.

It should also be remembered that of all the information written down only 5 % constitute new knowledge, according to the expertise of the present staff.

It follows that most of the information procured must be discarded at once. Should the need arise at a later date, then it is cheaper and quicker to make a search utilizing outside sources of information.

Participation of Staff Members

Staff members ought to participate in the evaluation and selection of information in order to:

- promote the professional communication in the enterprise
- promote the organizational development of the company
- cultivate their ability as to creative thinking.

The participation should be organized by arranging groups of staff members having different responsibilities. The group members should meet regularly in order to report verbally on their findings.

Experience has shown that such groups are not only a forum for exchange and evaluation of information, but also for discussion and problem solving.

"There are no major differences between the information operations carried out by small, medium, and large enterprises".

BART E. HOLM:

SCIENTIFIC AND TECHNICAL INFORMATION SERVICES – SIGNIFICANT PARTS OF THE ENTERPRISE STRUCTURE *(D.1 (21))*

User's Needs and Behaviour

Information services must realize the diversity in the individual's need for information and his habits, and must maintain continuous interaction with him to react to his changing needs.

a. *The research man is discipline oriented.*
He receives information from the literature and through personal contacts with colleagues, especially from outside. The written document is his primary product, and he publishes regularly.

b. *The technical man is mission oriented.*
When he needs information, he contacts his colleagues in the company and searches his own files and the departmental files. He is less inclined to publish since his primary product is usually a piece of work, a design, or a functional product.

c. *The marketing man is business and product oriented.*
He needs data, demographic information, status of competition, and pricing factors. His product tends to be an internal report on use analyses and proposed strategies.

Other observations of user's reactions are:

- Very few want to wait more than three days for an answer from an information service.
- Users want the information service to screen the raw output.
- Most users would rather not use terminal equipment. This is a useful device for information specialists in interrogating a large mechanized information store.
- Informal communication is still the most important transfer mode, particularly among research people.

Local or Central Services

Information activities should begin by serving local needs with local services. As these grow and begin to overlap, a combined system may gradually be established.

Central services are justified:

- to eliminate duplicate files
- to eliminate the need for multiple questions
- to provide services not available locally
- to provide a broader base for internal systems work.

The end result is a proper balance of local and centralized information services. Both are needed.

Information Services in a Large Enterprise

The DuPont Company provides the following services:

1. *Current awareness,* which may be thought of as continuous professional education.
   This service produces and circulates abstract bulletins. Journals or tables of content are circulated on request.
2. *Selective dissemination* is the concept of obtaining desired material from the remaining published literature beyond that scanned by the individual.
   This system is operated manually, but experiments with mechanized systems are going on.
3. *Retrospective search* is looking for information to answer a specific need.
   A Central Report Index makes abstracts and indexes of internal reports. An inquirer will first receive abstracts and thereupon complete reports, if wanted.
   Two patent services produce abstracts and indexes of patents. The abstracts go into various alerting bulletins.
   A Central Chemical Registry provides reference files of nomenclature and formulas. It also processes the published literature.
   A Commercial Information Centre produces an alerting bulletin and answers specific questions.
4. *On-site information analysts* are members of the central information organization, which are assigned to a local group to serve its information needs. The central information organization provides the hiring, training, rotation, and promotional opportunities.
5. *Internal consultation* is available to individuals and guides them in indexing their personal information material for efficient manipulation by a mechanized system which provides printed indexes for their own use.

"There is a need for continuously closer interconnection between the information, the man interpreting it and the man using it".

JOHN S. RIPPON:

THE INDUSTRIAL INFORMATION SPECIALIST AS A MEDIATOR IN THE INFORMATION TRANSFER PROCESS *(A.3 (13))*

The Need for a Mediator

There are many central services which offer current awareness service or retrospective searching. Systems that enable the user to interrogate an information store and receive data transmitted from a remote centre also exist. They will, however, not reduce the need for a mediator between the sources and the user:

1. The nearest approach to a service for individuals is an S.D.I.-system supplying users with information corresponding to their self-prepared interest profiles. But even these services are not satisfactory:
   - The user requires the help of an information specialist in order to construct a useful profile.
   - They can be very expensive when the number of users is large.
   - They generally supply lists of titles and references only – no abstracts.
2. Central services normally give a set of references or documents containing much irrelevant or redundant material.
   Since many users do not have the time to sort out the relevant information, it is more efficient if the information specialist formulates the request and extracts the required information from the answer.
3. A central service will not be able to give relevant but unasked-for information. One of the mechanisms for tracing useful information is, however, the unexpected encounter that leads the searcher into new territories. This points to the need of a local

information specialist who has a much better understanding of the reasons underlying a request for information.

4. Information must usually be gathered from many sources of which many users will not be aware. The information specialist has a much better knowledge of these, and he has via his colleagues in other information units access to a wide range of expertise.
5. The information specialist has the skills needed to perform a search in the most efficient way.
6. The local information unit must in any case maintain its own system:
   - The material in central agencies is often not so up-to-date as in the local information units.
   - The coverage of central services is often restricted to certain prescribed classes of material.
   - Central services do not include confidential information.

Relationship with the Users

The information specialist must be in close touch with the current thinking of those he serves.

He should be regarded not as a servant who waits to be called, but as an active member of the management, production or research and development team.

The number of staff in the information unit must be high enough to permit each member to be assigned to a particular project team.

The responsibilities of the information specialist include:

- Becoming acquainted with the work and interests of his group of users.
- Drawing attention to significant current developments.
- Performing information searches.
- Putting his users in touch with internal and external information sources.
- Producing abstracts, indexes and literature surveys.

"Perhaps the firms who don't manage information may not be in operation in the future".

S. R. RANGANATHAN and A. RAHMAN:

HOUSE-DOCUMENTALIST'S WORK: ITS NECESSITY AND VALUE *(D.31 (28))*

Importance of House Documentation

International and national documentation is not sufficient to meet the immediate needs of a company for the following reasons:

- time lag
- no specific orientation to the needs of a particular company
- large volumes cannot easily be circulated among all readers
- the cost of purchasing multiple copies is prohibitive
- high probability of the non-inclusion of some relevant articles occasionally published in periodicals of distantly related subjects (i.e. the problem of seepage).

Functions of a House Documentalist

The documentalist should:

- keep abreast of the development in technology and marketing
- be in continuous touch with the work-in-progress in the company
- develop the personality necessary to visit and to speak to anybody.

He should supply information:

- expeditiously – "Save the Time of the Reader"
- exhaustively – "Every Document its Reader"
- pin-pointedly – "Every Reader his Document".

Documentation Activities in a Factory

Among the documentation activities of a specific machine tool factory the following deserve notice:

a. The problem of seepage is surmounted through cooperation with documentation services in other companies. Each company thus receives information appearing in periodicals falling outside their area of primary interest.
b. Digests are prepared of articles of immediate interest and value to the company.
c. Interesting news is summarised in News Briefing Notes not exceeding one page and passed on to the top management.
d. Small groups of engineers from various departments meet every fortnight to study and discuss articles of particular interest.

> "*We must bring into active involvment in the information programme those people for whom the programme is designed*".

J. VEJE JENSEN:

DESCRIPTION OF AND REFLECTIONS ON AN INFORMATION SYSTEM ESTABLISHED BY A/S NORDISKE KABEL- OG TRAADFABRIKKER, COPENHAGEN *(D.11)*

The following considerations preceded the establishment of the information system:

a. Information is only valuable if it is evaluated in relation to the situation of the company. It must further reach the possible users in time.

b. One should endeavour to influence and exploit the general tendency towards formation of informal groups.
c. If an individual's own need for information is met, he will be inspired to inform others.
d. The communicating distance between those who receive and evaluate information and those who may utilize it should be reduced to a minimum.
e. Individuals wish to participate in a system which gives them possibilities of showing personal results.
f. Cooperation between senior and junior staff members trains the juniors and inspires the seniors.

The Information System

1. Interest Groups

An interest group is composed of technical staff members from those departments particularly concerned with the main subject (e.g. processes, installations or control systems) which is under review. The group members are often those who become directly involved if the proposals are to be realized. Meetings are held at least once a month. The activities are:

a. To investigate problems and discuss experience.
b. To evaluate information which the individual member has received since the last meeting, either through compulsory reading of journals or in another way. A decision is made as to what is to be done with each particular item of information.
c. To inform others in the company of the results of the meeting.
d. To carry out, by request of the management, investigations of subjects within the field of interest of the group.

2. Information Centre

This centre has the following tasks:

a. Procurement, registration, distribution and filing of books, journals, etc.
b. Secretarial work for the interest groups, including circulation of journals for compulsory reading.
c. Registration of: – selected technical knowledge
   – "profiles" of individual staff members
   – suppliers, competitors, etc.
d. Provision of information from external sources upon request from staff members.

3. Committee on Technical Development

This committee comprises the production managers and the heads of laboratories and departments. It coordinates the work of the interest groups and decides on proposals on which the line organisation has been unable to take a position.

"I think that the description of the seven stages of innovation is extremely relevant in relation to information".

FRANTISEK VALENTA:

INVENTION AND INNOVATION *(A.7 (2))*

The general variability of the world can be divided into two main groups:

1. The variability of real structures (production structures, general social structures, structure of their natural environment). Any change taking place in the real structures is taken for an *innovation.*
2. The variability of the structure of the human understanding of the world (scientific as well as simply empirical). Any change taking place in the structure of human understanding is taken for an *invention.*

There are three limits to the human creative activity:

1. Imagining another state of human understanding and of real structures.
2. Creating a new understanding (i.e. limits in inventive activity).
3. Changing the real structures (i.e. limits in innovative activity).

An investigation of the process of innovations of products has shown that the different grades of innovation tend to crowd themselves into certain places. It is possible to differentiate between eight *orders of innovation* depending on to what extent the real structure is changed:

Zero order: Regeneration of the real structure, keeping it in a given state.
First order: Changing the quantity of elements and the relations of elements.
Second order: Re-grouping relations of elements.

Third order: Changing the quality of elements and relations (e.g. changing the construction of a product to adapt it to machines or skill of labour used).
Fourth order: Changing the functions of some of the elements (i.e. *new variant).*
Fifth order: Changing all the substantial functions of elements on the basis of previously used conception (i.e. *new generation*).
Sixth order: Changing the conception of functioning elements (e g. the car with Wankel-engine), based on the original principle (the car with Wankel-engine remains the car on wheels, driven by petrol) (i.e. *new kind of elements).*
Seventh order: Changing the substantial principles of construction. Such an innovation causes a revolutionary change in production as well as in society.

The higher the order of innovation, the longer the corresponding time-lag in transferring invention into innovation. The time-lag may be shortened by

- Organizing inventive and innovative activities as one comprehensive field.
- Organizing rational links of information circuits.

"The development of forecasting techniques is essentially an extension of the information system rather than a new topic".

B.N. TARDOV:

METHOD FOR SCIENTIFIC TECHNICAL PROGRESS FORECASTING AS BASED ON *DYNAMICS OF DOCUMENTAL INFORMATION*

(A.8 (34))

The aim of scientific technical forecasting is the definition of the main trends in the development of science and technology.

Forecasting can be based on an analysis of information about patents granted for the following reasons:

1. A granted patent is utilized on the average within 11 years as experimental production. Within the next 9 years half of the companies in a given field will be engaged in mass production.
2. About 65 % of patented inventions are utilized or applied in production (giving a profit) and consequently determine scientific-technical progress for the future. Patented inventions may thus be regarded as an immitation feed-back from the future with a probability of 65 %.
3. There is a close interrelation and mutual dependence between the dynamics of patenting and the dynamics of other industrial economic indices.

CHAPTER II

Users of Information

> *"When we are talking about the sources and the transfer of scientific and technical information, we are concerned with how this looks from the user's end. And the measure of success is in what the users do differently as a result of the information; not simply in what you are doing differently in attempting to get to them".*

ODD VATTEKAR:

USERS OF INFORMATION IN THE ENTERPRISE *(D.5 (II))*

The individuals in an enterprise have a demand for information which, if not satisfied, will result in problems. The demand may be due to:

- an actual need
- a striving for knowledge
- mere curiosity
- the wish for a symbol of status.

A study of the relationship supervisor/manager has shown that the following are the most common complaints of the supervisors:

- Responsibility not clearly outlined
- Unsatisfactory information from management regarding conditions of work, plans, etc.
- Unsatisfactory contact with and assistance from management
- Too many demands from opposing interests.

Information may be divided into three groups:

1. Technical Information

This is of vital importance for the development of an enterprise with regard to processes, materials, products, markets, etc.

Due to the enormous production of technical information a problem of the users is to avoid being inundated by this material.

The problem may be solved by establishing a literature service which should register and, if necessary, extract and convey relevant technical information.

An example illustrating the flood of information: A company stopped 30 % of this flood in one of its sections, but none of the users reacted during the first six months.

2. Operational Information

This comprises orders and instructions governing the activities, and surveys and reports informing about developments, trends, results, etc.

All these add to the complexity of the system. Not only is the flood of information increasing, but so is the number of information donors and information users.

A specific company has built up an information system by means of integrated data processing. The system covers production planning and control, sales and economy. The production people receive each morning a report which shows what has not been done in yesterday's production. The departments of sales and economy get similar statements, and the top manager is correspondingly informed. This system resulted in the disappearance of several rather extensive current tasks.

3. General Information

It is characteristic of this group of information that it may be useful to our work without having any direct connection with it.

> *"In trying to be all things to all men our information systems become less responsive to individual users".*

SAIMA WIKLUND & HELKA HOLLMÉN:

THE NEED AND USE OF SCIENTIFIC AND TECHNICAL INFORMATION IN FINNISH INDUSTRY *(C.26 (8))*

Nordforsk has initiated a joint Scandinavian study of the user of information. Among the results regarding Finland are:

Production management feels that it is overfed with information, while research workers and constructors do not feel this.

A person in production management spends 1-3 hours a week reading journals, whereas a R & D worker uses 3-6 hours.

People in production management use more time to acquire non-printed information (e.g. conferences, meetings, personal contacts) than other groups.

92 % answered that they seldom made use of external services (i.e. libraries or information services). This seems to indicate that the external services are not sufficiently known.

Among the user's wishes were:

- Better abstracts in journals.
- Division of journals among selected readers.

"It is impossible for the information man to tell the user what he needs, even if sometimes you despair because he doesn't know what he needs. You must still encourage him to ask the questions for himself."

G. F. GAINSBOROUGH:

THE PERSONAL RESPONSIBILITIES OF THE ENGINEER AND HIS ORGANIZATION IN THE UTILIZATION OF SCIENTIFIC AND TECHNICAL KNOWLEDGE *(C.33 (36))*

The responsibilities lie in three main areas:

1. Engineers, contrary to scientists, are reluctant to record and communicate the knowledge they create.

The *engineer* should therefore learn to recognize the novel features of his work, learn the techniques of communication, and take the time and trouble to apply them.

Some *private enterprises* do not encourage their engineers to write articles in journals, either due to indifference or to the belief that their commercial interests are not served by publication. It is noticeable, however, that many enterprises which do encourage publication, and which do encourage their employees to take part in the activities of professional societies, are among the most successful commercially.

The responsibility of the *professional learned societies* in this field lies in instructing engineers in the art and value of communication.

2. The learned journals and the abstracting journals now being supported by computers are of little interest to the practising engineer.

The *engineer* should therefore take an active interest in the media and techniques of communication and interact with editors and information scientists with a view to ensuring that the practical requirements of the engineers are met.

The *professional society* has the responsibility of providing the forum in which this interaction can take place and to stimulate the interests of its members in these problems.

3. A scientist faced with a new problem goes straight to the library to read, whereas the engineer tends to go to the laboratory or to the drawing-board. The difference is partly a result of different attitudes, but it is encouraged by the relative inadequacy of information services available to engineers.

The responsibility of the *engineer* is to learn how to find the available information and to seek this information.

The *private enterprises* have the responsibility of providing books, periodicals and abstracting journals. They must, however, also encourage their employees to take part in refresher courses, conferences, etc.

The *professional societies* often confine themselves to the publication and discussion of formal papers, which are mainly of interest to the scientists. The mature practising engineer has, however, the need for being instructed in subjects which have entered the university curricula since he graduated.

"The faculties that teach our scientists and engineers are themselves really not information-oriented in the way that they need to be, to teach their students in a proper way".

ROMAN ASLER:

PUBLICITY OF INFORMATION ACTIVITIES AND THE TRAINING OF USERS OF INFORMATION *(C.34 (10))*

Training of Users

The problem of utilization of information should be included in the curricula of academic schools with the aim of training the future users of information.

Lectures on the problems of information should also be included in the training courses organized to raise the qualifications of engineers.

The curriculum should comprise the following topics:

- where and how to seek information
- the kinds of information
- how information must be utilized
- how the domestic system of information is organized
- how the domestic system functions and cooperates with services abroad
- how a problem should be presented to an information center.

The curriculum should include both lectures and practical exercises.

"The information specialist must do a great deal more than educate his users. He must win their confidence".

HEINZ ZIEGLER:

CERTAIN PROBLEMS FACED IN THE TRAINING OF USERS OF INFORMATION *(D.6 (29))*

The term "user" is retained, although it does not express that he should be considered an *active partner* of the information specialist.

The user should help the information specialist to
- select the themes to be dealt with
- adapt the forms of the information material to the user's needs.

The Aims of the Training of Users

The training should:

a. Enable the user to explore the existing possibilities of getting information.
b. Teach him the methods which have proved successful in information work.
c. Teach him to formulate his information needs clearly.
d. Help him to design his own information output in an appropriate way.
e. Develop a positive attitude to information.

Structure of the Training System

Basic instruction in the use of scientific information should begin with those who attend secondary schools, but should also be given to those who are already active in professional life.

The knowledge will have to be specialized according to the categories of users.

In the first place users should be grouped according to their

functions (not more than 10 groups). Secondly they should be categorized by *professions and trades.*

The *knowledge about information* to be imparted to the user may be divided into three groups:

a. General knowledge about information. This should be undertaken:
   - at schools for general education
   - by means of mass communication media (especially television)
   - by the methods of information propaganda.

b. Knowledge corresponding with the function of the user.
   The contents as well as the methods of lecturing should be elaborated centrally (i.e. for the entire country).

c. Knowledge corresponding with special fields of activities (science, economics, etc.).
   This knowledge should be selected by the information organs of the specialized branches.

In general the training should be prepared centrally and carried through in a de-centralized way.

"It would appear that information specialists are in an exceptionally good position to act as 'technological gatekeepers'."

THOMAS J. ALLEN:

MANAGING THE FLOW OF SCIENTIFIC AND TECHNOLOGICAL INFORMATION *(A.5)*

Communication and Performance

The human being has become the most effective source of technical information due to flexibility and ability to rapid response to the user's need.

Performance evaluation of project members shows that "high" performers

- have a far greater frequency of consultation with organizational colleagues
- spend much more time in these discussions
- consult with a greater number of people within their own speciality
- have much wider contact with people in other specialities.

The last-named finding is very significant and in keeping with the generally accepted explanation of the process of innovation (i.e. the linking together of remotely associated ideas in a useful context). Very often the components for an innovation can lie unnoticed for long periods of time in two separate fields. It is only when some communication is established between the fields that the innovation can occur. This is why great scientific discoveries are often preceded by a movement of the discoverer from one discipline to another (the interdisciplinary or multidisciplinary effect).

Support from outside the Project

It has been found that there is no relation at all between the engineer's perception of the benefits to be gained from an information

channel and the extent to which the channel is used. However, a very strong relation exists between the extent of use and the engineer's perception of the "cost" of using the channel.

This may explain the finding that project members obtain more of their ideas from outside their firms than from their own technical staff:

- It is not easy for a project member to admit to a colleague in his own organization that he needs his help.
- This is further compounded by the element of competition that exists among organizational colleagues.
- In addition the organizational reward systems do not recognize indirect contributions.

The "Technological Gatekeepers"

People who are used most frequently as internal consultants (i.e. "technological gatekeepers") differ from others in the organization in two respects:

- They maintain broader contact on an informal basis with technical colleagues outside of the organization.
- They read far more of the professional journals.

Nearly all the gatekeepers in a department can be found together as members of the same "strong component" of the communication network. The gatekeepers, therefore, maintain close communication among themselves.

New information is brought into the organization through the gatekeeper. It can then be communicated readily to other gatekeepers through the gatekeeper-network and disseminated outward from one or more points to other members of the organization.

This network has developed spontaneously with no managerial intervention.

The Structure of the Communication Network

In addition to formal organization structure there are available to management at least two other factors that can be used to influence the structure of the communication network.

1. *Informal friendship-type Relations*

People are more willing to ask questions of others whom they know than of strangers – basically because of fear of a critical response to one's question. Management should therefore increase the number of acquaintanceships among its technical personnel e.g. in the following ways:

- Interdepartmental projects
- Transfers within the organization.

2. *Physical Location of Facilities*

The proportion of people with whom an individual communicates decays with the square of distance outward from the focal person. The extreme sensitivity of communication to physical separation must be given careful consideration when positioning people.

For short term projects it may be necessary to [illegible] the members together in order to ensure effective coordin[illegible]. In the case of long term projects, however, technical perso[illegible]ould remain located with their specialist colleagues so they [illegible]p abreast of development in their technical fields.

Where it is desirable to have communic[illegible]een groups they should be located near each other. Wher[illegible] is impossible they can be made to share certain facilities th[illegible]l fo[illegible]ce interaction.

CHAPTER III

Information Activities at the National Level

"If government does have a responsibility it is to ensure that the responsibility is taken".

P. J. JUDGE:

GOVERNMENT RESPONSIBILITIES IN INFORMATION FOR INDUSTRY *(C.20 (37))*

In the first place it is the firm's own responsibility and in its own interest to secure the necessary information. But if the firm does not appreciate this point whose responsibility is it to educate the firm to awareness of its information needs? The question has national implications, for if the individual firms are not doing their best, the economy suffers. We must realize that the international competition is increasingly based on a high level of technology.

The government can promote the establishment of technical information services with the aim of:

a. determining new opportunities of applying technology,
b. preparing and disseminating technical literature,
c. identifying sources of expertise,
d. sponsoring industrial workshops, courses, demonstrations and field visits.

But *the government must also generate an innovative climate* through:

a. use of mass media,
b. more imaginative engineering education and management training,
c. legislation to encourage new capital investments,
d. special tax relief on R & D,
e. efforts to improve the structure of industry.

Outside the firm there are four groups that are concerned with the responsibilities of information:

1. Government agencies which operate information or technology utilization services.
2. Non-affiliated, non-profit foundations or research associations.
3. Commercial publishers and information services.
4. Engineering associations.

"The great difficulty with mechanized information retrieval is that the information selection criteria of the user cannot easily be translated into concepts that can be understood by the computer."

R. VAN HOUTEN:

SCIENTIFIC AND TECHNICAL INFORMATION FOR INDUSTRY *(C.0 (12) & C.0 (26))*

The Role of Technical Information

The ideal public technical information system should comprise the following services:

1. Liaison field services with central reference offices.
2. Specialized information centres.
3. One or more large techno-scientific libraries.
4. A network of fast working communication lines between the above services.

The Individual Firm and Technical Information

The needs of the firm for technical information have the following aspects:

1. *The nature of the required information*
   depends on the market, the nature of the product, the product-mix, and the production process.

2. *The transfer of technical information to a firm.*
   a. *The source,* e.g. suppliers of equipment and libraries.
   b. *The channel* of communication, e.g. telephone, postal connection and personal visits.
   c. *The medium,* e.g. books, periodicals and discussions.
   d. *The sensorial nature,* i.e. written or oral information.
   e. *The level of reception* within the firm, e.g. that of director, engineer-scientist or technician-foreman.

3. *The processing of technical information within a firm*
is influenced by the size of the firm and its social and scientific horizon.
In large firms the internal processing is sometimes hampered by long communication lines.
An interesting phenomen is that of serendipity, i.e. that useful information is sometimes obtained for which no search was made in the first instance.

4. *The contact between firms and public information services*
depends on:

   a. *The character of the firm.*
   Firms can be categorized as follows:
   - The nature of activities:
     "Modern" firms subject to continuous strong technological change.
     "Traditional" firms.
   - The character of management:
     "Progressive" firms, i.e. open to new ideas.
     "Conservative" firms.
   - The size of the firm:
     Large firms with formal structure.
     Medium-sized firms.
     Small firms with informal structure.

   b. *The level of the contact.*
   Modern progressive firms are mostly contacted by correspondence or telephone.
   Contacts to traditional progressive firms are established through personal visits and followed up by correspondence or telephone.
   Small and medium-sized traditional firms with conservative management require continuous personal contact largely of a missionary character.

c. *The training of the staff of the public information service.*
A distinction is made between:
- *The field staff* consisting of engineers with an extensive industrial experience.
- *The home staff* consisting of a mixture of engineers and librarians.

5. *The categories of information sources.*

The sources can be found through general directories, annual reports or referral services.

Existing Public Technical Information Services

There have been four main causes for the establishment of such services for industry:

1. The success of agricultural extension services.
2. The productivity movement, with the aid of the Marshall Programme.
3. The wish of many libraries to find better means of transferring their information to industry.
4. The initiative by governments of countries with centrally planned economies.

The technical information activities can be distinguished as follows:

1. *Question and answer services.* Most of these attempt to solve the problems submitted to them, but some of them are simply referral services.
2. *Field extension services.* The field engineers assist in spotting and formulating problems and in solving these.
3. *Documentation services,* which keep firms currently aware of the latest development reported in the literature.
4. *Industrial engineering services* giving advice mainly to small firms on work study, plant layout, quality control, etc.

"The concept of need-groups, presented in the SATCOM report, is one of the most important concepts to have originated in the last few years."

COMMITTEE ON SCIENTIFIC AND TECHNICAL COMMUNICATION (SATCOM), USA:

SCIENTIFIC AND TECHNICAL COMMUNICATION *(E.1)*

The Climate for Solution

The *diversity* in information-handling activities is not only characteristic, but essential. It facilitates the flexibility, the responsiveness to user needs, and the innovative, forward-looking approaches required for effective scientific and technical communication.

There are, however, areas in which greater effort is necessary for adequate performance:

The most pressing need is the establishment of *need group services* which should provide effective service to professional groups having common information requirements, by consolidating primary information and reprocessing the products of secondary services.

The *scientific societies* have the responsibility of

- improving the quality and timeliness of primary publications
- assuring basic abstracting of this information
- stimulating reprocessing for special user groups
- conducting studies of the information services they sponsor, with the participation of qualified scientists and engineers.

The *for-profit organizations* can further the reprocessing of information through their ability to understand and serve users.

The *government* has a responsibility to support information activities required for the accomplishment of its various missions. It must further support various information efforts in the public interest.

Users normally work under conditions that offer far larger rewards for doing "new" work than for finding the results of work already done. They are generally slow to change their habits of information use.

Information services should be governed by the following principles:

a. The management of information activities must be *responsive* to the needs and ideas of the groups that they serve. These activities must be *flexible* to adapt rapidly to changes in user needs and communication techniques.
   To accomplish this objective there is need for a balance of influence among these managers, the generators and users, and those who market information.
b. Authority over administrative bodies responsible for information programmes must be sufficiently widely distributed to achieve the necessary responsiveness (i.e. participation of the members of the scientific and technical community is vital in securing flexibility and innovative approaches).
c. Constant attention must be paid to the simplification and consolidation of existing knowledge and its frequent reprocessing to adapt it to the needs of diverse users, especially those engaged in its practical application.
   This involves the exploration of new computer-aided techniques, inexpensive and rapid photoduplication, etc. The development of new services should, however, be gradual; present ones should not be discontinued before the ability of new ones to replace them has been demonstrated.

Recommendations on Specific Courses of Action

Planning and Coordination at the National Level (U.S.A.)

a. A broadly representative, non-governmental body of high prestige ("Joint Commission") should be established, with the aim of coordinating the interests and programmes of private and governmental organizations in the information field.

b. Government-sponsored, but discipline-oriented programmes should be managed by appropriate scientific societies.
c. Sponsors of R & D work should recognise their responsibilities for processing the information for access, consolidation, and use in special contexts.
d. International cooperation should be promoted through sharing both work and products across national boundaries.

Consolidation and Reprocessing

a. Scientific societies should further the preparation of critical reviews and data compilations and the education in their use.
b. Engineering societies should increase their attention to information programmes of particular interest to practitioners.
c. Societies supporting basic abstracting services should test arrangements which would make the transfer for reprocessing financially feasible at approximately output costs.
d. The proposed Joint Commission should stimulate the use of information analysis centers dealing with particular subject areas and capable of serving specialized need groups.

Personal Informal Communication

The growing tendency toward information-exchange groups, team research, and conferences are evidence of the necessary role of informal communication and the increasing dependence on it. It is therefore important to

- provide ample opportunities for informal communication at scientific and technical meetings
- encourage leave and sabbatical policies that foster inter-institutional visits and exchanges of personnel.

"To stimulate innovation it is not enough to publish and make available to industry the latest results from research. Many other factors are involved and must be attended to if the optimum conditions for rapid and successful technological development are to be achieved."

C. G. GILES:

THE MATERIALIZATION OF SCIENTIFIC RESEARCH RESULTS IN BRITISH INDUSTRY

(C.23 (18))

Mintech

The Ministry of Technology (Mintech) was set up in 1965. Its formation recognised the dependence of an advanced industrial society on the systematic exploitation of science and technology.

Some of the actions taken by Mintech have been:

a. Assistance to mergers.
b. Introduction of Cash Investment Grants for capital expenditure on new plant and equipment.
c. Encouragement of investment in R & D by taxation allowances.
d. Financing the purchase of pre-production models of new machine tools.
e. Placing research contracts with industry.

Methods for Communication of Results and Ideas

1. *Mass media*, like press, television, radio, films, exhibitions and conferences are used by Mintech to encourage those who can influence the pace of innovation to be responsive towards new opportunities for technological advance.

2. *Technical journals* are also used by Mintech. They play an important role in furthering the spread of ideas.

3. *Mintech publications* comprise a series of priced and unpriced publications, among them a monthly bulletin aimed at key people in industry.

4. *Report literature.*
   Mintech has established a Reports Centre that collects, abstracts and distributes laboratory reports. They are announced in a bi-monthly abstract journal which also includes reports from other countries.

5. *Abstract journals.*
   Some of these are produced by Mintech Research Establishments.

6. *Libraries.*
   Specific mention must be given of the National Lending Library which collects all serial literature likely to be of interest to practising scientists and technologists.

7. *Regional Offices and Industrial Liaison Centres.*
   Since the person-to-person communication plays an important role in the transmission of new ideas, Mintech has set up a number of regional offices and liaison centres.

8. *Productivity Services.*
   Mintech has financed such services working as mobile demonstration units which give advice on application of new production methods.

Other services sponsored by Mintech are dealing with numerical control, instrumentation, materials technology, tribology and low-cost automation.

"The experience of the various existing technical information services has indicated the great importance of personal contact with industrial firms by means of field engineers, and the fact that it is mostly the smaller firms that are in need of assistance in this way."

RALPH E. MCBURNEY:

TECHNICAL INFORMATION SERVICES IN CANADA *(C.43 (4))*

The National Research Council (N. R. C.) is the major government source of scientific and technical information for secondary manufacturing industry.

Its ten research divisions inform industry through bulletins, reports and scientific papers.

The N. R. C. staff gives individual consultation to companies, normally on contract basis.

Its subsidiary, the Canadian Patents and Development Corporation, examines research results as to their suitability for patenting. It may also help in financing development of inventions. It keeps industry informed of such inventions through a handbook and semi-annual supplements.

The Public Relations Office publishes a semi-monthly bulletin which is written at a layman's level in an informal style and often results in inquiries.

The Main Library with six branch libraries keeps industry informed through a number of publications.

Although these services are available to both large and small industry, it has been found that the small companies, which form an important sector of the Canadian economy, make little direct use of them.

Therefore, the *N. R. C. Technical Information Service* was established. Its function is to provide technical information, free of charge, on materials, efficient operation of production facilities, new ad-

vances in technology, and results of scientific research. T.I.S. comprises a central office and eleven field offices. The activities are organized into three sections:

a. Technical inquiry and answer service
b. Industrial engineering section
c. Technological developments section.

Field officers are visiting companies to provide information and assist in solution of productivity problems. If they cannot offer immediate help, they refer the problem to a research council.

The field officers also play an important role in the crossfertilization of information between industries. While maintaining commercial secrecy, they are often able to transfer useful technology from one industry to another.

A technical awareness programme provides selected information to specific fields of industry.

"A field service is always one of the most important ingredients of a technical information service for industry, irrespective of whether the information service operates on its own or is connected to a research organization, government department or productivity organization."

KJELD KLINTOE:

TECHNICAL INFORMATION SERVICES IN DENMARK *(C.44 (15))*

The Translation of Scientific and Technical Progress into Industrial Practice

The transfer of knowledge from science and research via libraries, documentation means and information officers to industry may be likened to the transfer of physical goods from manufacturers via stores, catalogues and salesmen to the consumers.

The role of a technical information service is thus one of marketing knowledge.

In 1955 the Danish Government took the political decision to establish the *Danish Technical Information Service* (DTO) in order to further the development of Danish industry through information service and liaison service activities between industry and research. DTO is now affiliated to the Danish Council for Scientific and Industrial Research.

The main characteristics of DTO are:

a. It is a *general* technical information service.
b. It works for firms having an *industrial production*.
c. It is *not* confined to technical problems, but covers also problems of marketing, economics, organisation, etc.

The activities comprise:

- *Field liaison engineers* visit the firms uninvitedly with the aim of stimulating their demand for knowledge, informing them of sources of knowledge, and obtaining their profile of interest.
- An *active information service* disseminates to the firms invited information according to the profile of the individual firm.
- *Conferences and courses* are arranged aimed at stimulating the efficient utilization of knowledge and the crossflow of information, promoting specialized information services and training in how to organize the information flow.
- The *question and answer service* transmits requests for knowledge, documentation, etc. to the appropriate source of information, particularly by establishing personal contact. It further undertakes confidential intelligence service at a charge.
- An *advisory service* guides individual firms (at a charge) in setting up an internal information service.
- Finally DTO has promoted *specialized information services* for various trade organisations.

The *Danish Centre for Documentation* is the national organisation for documentation. It is affiliated to Denmark's Technical Library. A documentation service based upon magnetic tape received from international sources has been established.

"The houses of technology play a very important and fundamental role in developing handicraft into industry."

M. SUSKA:

HOUSES OF TECHNOLOGY *(C.45 (23))*

Information centres must be interested not only in keeping a close contact with the users themselves, but also with various organisations and institutions likely to extend the circle of efficient users of information.

The Czechoslovakian information centres therefore cooperate with the Houses of Technology in the country. This cooperation offers the following possibilities:

1. *Congress and lecturing activities* as well as more unconventional forms of education are considered some of the most efficient channels of propagating information material and services. The result of these activities is directly reflected in the lending or ordering of information material at the centres concerned.
2. A special kind of activities are the *periodical festivals of scientific and technical films*. These events represent probably the only possible kind of selection, qualitative approbation and registration of these modern and efficient information media.
3. Information obtained through *personal contacts* within the framework of congressional, consultant or exhibitional activities is of the utmost importance due to its actuality. There are several reasons for this:
   a. The publication time for periodicals today is too long due to various administrative restrictions.
   b. The scientist is reluctant to publish cognitions which are not thoroughly verified. – By personal consultation, however, it is possible to attain a sensible progress through the confrontation of opinions.
   c. Information which appears in periodicals must to a certain extent be of a general nature. – The explanation of the

eventuality of their application is not possible without the personal confrontation of views.

4. *International cooperation* is among other things promoted by attending thematically limited or thoroughly specialized events, such as symposiums and colloquies.

   Large congresses attended by thousands of specialists are avoided. The preparation of such events is very pretentious and slow, and the material consequently loses its actuality.

> *"Transformation and distribution of information about and application of the scientific technological progress is of major importance to continued economic growth."*

MORTEN V. KNUDSEN:

THE IDEA, ROLE, AND WORK OF HOUSES OF TECHNOLOGY IN THE SCANDINAVIAN COUNTRIES *(C.46 (6))*

Inspired by the results of the advisory services for agriculture, the first Technological Institute in Denmark was set up in 1906 with the aim of adapting and applying industrial development to the needs of small-scale industry and handicraft.

The activities lie in the following fields:

- *Training and teaching* are mostly carried out in the form of medium and short courses in technology and management for owners, middle management, technical staff and skilled workers.

- *Advisory service* comprises instruction on materials, machinery, production planning, maintenance, cost problems, etc. The activities include visits, demonstrations, question and answer services and publication of reports and bulletins.
- *Research* is mostly carried out in connection with the technical advisory service. It comprises investigation of problems of processing and equipment, testing of raw materials and products, as well as collection and dissemination of information of interest to industry and handicraft.

> *"The staff of question and answer services should comprise engineers with industrial experience at various levels so that they can understand industrial situations. The use of research laboratory scientists who, for whatever reason, are not happy in their laboratory work, is not advisable."*

HERMAN DE JAEGER:

NATIONAL CENTER FOR SCIENTIFIC AND TECHNICAL DOCUMENTATION *(C.51 (31))*

The National Centre for Scientific and Technical Documentation (CNDST) in Belgium was founded in 1964. It works in close cooperation with the Royal Belgian Library with the aim of promoting documentation in industry, research and science. It is financed by the state, and its service is free of charge.

General Tasks

The information scientists of CNDST are responsible for
- searches in information material
- procurement of information material
- compiling references and abstracts
- maintaining liaison with users and suppliers of information.

A questionnaire is used for inquiries. Duplicate questions are frequently received, particularly when a new technique has been published in the press.

Particular Tasks

Among the particular tasks may be mentioned:

1. *Editing* of various publications, e.g. catalogue of foreign periodicals, calendar of international meetings, bibliography of Belgian journals and articles, directory of research centres, etc.

2. *Advisory service* on the establishment of special libraries and documentation services.
   The same department also organises short documentation courses for scientists and special librarians.

3. *Referral function*. One of the chief functions is to put inquirers in touch with the best source of information. This service very often brings together scientists who are working in the same field.

4. *Research projects* have been carried out on
   - users' needs (in the field of medicine)
   - scientific information flow (in the field of chemistry)
   - automation of documentation services.

CHAPTER IV

International Cooperation in the Field of Information

> *"Science, technology and industrial development are now internationalized. There are of course many barriers to communication in various places but we are dealing with essentially international systems with essentially national or only partly internationalized tools. We see around us the growing interest in this internationalization, in many individual places and organizations."*

ALEXANDER KING:

THE SCIENTIFIC AND TECHNICAL INFORMATION IN THE MODERN SOCIETY *(A.0)*

We live in a world of rapid change. Over the last decade the OECD-countries have increased the gross national product by 50 % and it is very probable that the next decade will see a further increase of another 50 %.

This raises the question as to how much science and technology and the information process associated with them have contributed to this growth. In the USA it has been calculated that the growth of the economy since the beginning of this century can be explained only to an extent of 40 % by extra capital and extra labour.

The greatest proportion of the growth is due to increases in the quality of labour through education and training from management to workers on the one hand and to the quality of utilizing capital to improve technology, processes, etc. on the other.

This indicates that science and technology by means which are not very clear, and which cannot be quantified completely, have contributed enormously to the growth of the economy.

A number of complex problems, however, have arisen directly or indirectly through science and technology, through rapid innovation and industrialization.

These problems are marked by three characteristics:

- they are global problems (they appear in all industrialized societies irrespective of the political structure, psychology etc.)
- they are multivariant problems (they are unlikely to be cured by simple scientific and technological solutions)
- they interact (e.g. the pollution of the big lakes in North America may be a result of the use of fertilizers).

Everything is connected to everything else in this field. However, the structures in our universities, in government departments etc. are statically envisaged vertical structures with very little cross linkage and very little communication possibility between. The possibility of multidisciplinary attack of these problems by scientists, natural scientists, social scientists, economists and others is difficult to achieve in our rigid structures.

These matters are requiring approaches of a new kind e.g.

- systems analysis for the definition of the various fields
- integrated forecasting, i.e. partly technological and partly social forecasting.

We are pressing for a rapid understanding of the innovation process and for the information officer to be really an innovation officer, interested not only in uncovering, selecting and transmitting information, but doing so within a system of innovation which runs from invention through innovation to application and production.

In this world of complexity the task of information becomes rather different from that of the past. It has to be highly selective and highly integrative.

Discipline or mission oriented networks are not enough. While information services in general have a large influence on the development of research they are not greatly used by the industrial communities in the broader sense. And the computer with all its values is tending to supply too much information to decision makers in many places.

While we have been looking for the last few years at questions of storage, retrieval etc., now the selectivity factor, particularly in industry, becomes again the most important.

"I hope that FID can in some way invent a mechanism of permanent innovation."

W.K. Lowry:

FID AND INDUSTRIAL INFORMATION SYSTEMS *(B.35)*

FID serves a useful function in

- providing an international forum of professionals for the exchange of ideas on information matters
- providing societies with some practical products as a result of international cooperation among its members and with other international bodies.

In the future FID should

- become more expert in adjusting itself to new situations arising from changes in national and international affairs. FID must learn the art of managing change itself.
- take the initiative on many fronts concerned with information transfer, including industrial information services.
- orient its activities in a manner consistent with the needs of research and development.

"UNESCO is trying to work towards the creation of a general world system of information which one might compare to the creation of the overall telephone system which we enjoy today without thinking of international links."

O.A. MIKHAILOV:

SCIENTIFIC AND TECHNICAL INFORMATION AND INTERNATIONAL CO-OPERATION *(B.O (25))*

UNESCO

The main objects in the information and documentation field are to:

- Standardize advanced documentation processes.
- Work out specifications and standards for the organization and operation of documentation centres.
- Co-ordinate research activity in the field of information and documentation.
- Unify bibliographical description and catalogue cards.

- Develop the ISO international rules for abbreviation of titles of periodicals.
- Compile an international thesaurus of documentation terms.

A. Wysocki:

UNISIST (THE PRESENT STATE) *(B.2 (38))*

UNISIST is a joint ICSU-UNESCO project to study the feasibility of a world science information system based upon voluntary co-operation of existing and future information services.

The main characteristics are:

- Services in natural sciences are given priority. However, at a later date these are to be extended to technological information services.
- Questions of standardization will be included.
- Special attention will be paid to scientists in the developing countries.
- The problem of language barriers will be carefully considered.

"OECD as a body representing advanced industrialized countries – is trying to relate policy in information to policies in science."

P. J. JUDGE:

RESPONSIBILITIES OF INTERNATIONAL ORGANIZATIONS BY THE STI TRANSFER – THE ROLE OF OECD *(B.33)*

OECD

The main object in the field of information and documentation is the development and co-ordination in the member countries of the national policies for scientific and technical information.

The programme includes:

- Identification of the government responsibilities for national information activities.
- A study of the functions of the "national focus" for promoting and co-ordinating national activity in the field of information.
- An identification of the bases for government decisions relating to information.
- A description of the institutional and managerial arrangements, in different member countries, for government policy action in information.

H. W. EINHAUS:

UNIDO INDUSTRIAL INFORMATION SERVICE *(B.31 (24))*

The UNIDO Industrial Information Service shall:

- Function as the co-ordinating centre for an information transfer network to enable users in developing countries to have ready access to industrial information on a world-wide basis.
- Assemble and maintain specialized industrial information banks (limited to specific aspects of industrial development).

> "– *an extremely significant because very simple and common sense approach to the problem of information to the underdeveloped countries.*"

THORKIL KRISTENSEN:

ASSISTANCE TO DEVELOPING COUNTRIES IN THE FIELD OF SCIENTIFIC AND TECHNICAL INFORMATION *(B.4 (30))*

The industrial countries, unlike the developing countries, are able to apply modern techniques in production.

This does not mean that the developing countries simply need a network of information machinery so that our techniques could be transferred to them. Even if information were available, the developing countries would still be unable to apply the modern techniques because they are short of capital and of highly qualified manpower.

The needs of the developing countries in the field of science and technology are:

In *agriculture* the main problem is to develop techniques that are adapted to the climate in the different developing countries. This requires a vast network of institutes for adaptive research and of extensive services.

As capital is short and labour is abundant there is a need for rational, but simple tools.

In *small industry* there is a need for intermediary-techniques, i.e. techniques that are based on modern science, but which are labour-intensive.

In *large industry* the modern techniques are so superior in various respects that they may be appropriate even where wages are very low. Here the best solution for the developing countries will be to permit firms from the industrial countries to make investments and produce locally as much as possible.

Appendix I

LIST OF PAPERS

GROUP A

The place and role of scientific and technical information (STI) in human communication

A.0 The scientific and technical information in the modern society
Alexander King, OECD, Paris

A.3 (13) The industrial information specialist as a mediator in the information transfer process
John S. Rippon, The Metal Box Company Ltd., GB

A.5 Managing the flow of scientific and technological information
Thomas J. Allen, MIT, USA

A.6 (1) Utilizing systems analysis and operations research to facilitate the transfer of scientific and technical information
Harold Borko, System Development Corporation, USA

A.7 (2) Invention and innovation
Frantisek Valenta, Prague School of Economics, CSSR

A.8 (34) Method for scientific technical progress forecasting as based on dynamics of documental information
B.N. Tardov, Moscow, USSR

A.10 (19) Information et stratégie d'entreprise
Jean de Laclémandière, UFOD, France

GROUP B

International problems of communication and cooperation in the field of scientific and technical information for industry

B.0 (25) Scientific and technical information and international cooperation
O. A. Mikhailov, UNESCO, Paris

B.2 (38) UNISIST (The present state)
A. Wysocki, UNESCO, Paris

B.4 (30) Assistance to developing countries in the field of scientific and technical information
Thorkil Kristensen, Instituttet for Udviklingsforskning, Denmark

B.31 (24) UNIDO industrial information service
H. W. Einhaus, UNIDO, Vienna

B.33 Responsibilities of international organizations by the STI transfer – the role of OECD
P. J. Judge, OECD, Paris

B.35 FID and industrial information systems
W. K. Lowry, Bell Telephone Laboratories, USA

GROUP C

Sources of scientific and technical information for industry and transfer of information

C.0 (12) Scientific and technical information for industry

C.0 (26) (Addendum to C.0 (12))
R. van Houten, TIS, S. Africa

C.1 (9) Analysis of the main scientific and technical information sources for industry
Wojciech Piróg, CHNTE, Poland

C.11 (35) Importance of specialized information of the abstract and bibliography type for creative work of engineers in industrial corporations
M. Douda, CKD Dukla, CSSR

C.20 (37) Government responsibilities in information for industry
P.J. Judge, OECD, Paris

C.22 (33) Justification for a more simple approach to communication of information for use in industry
J. Halkin, Union Miniere S.A., Belgium

C.23 (18) The materialization of scientific research results in British industry
C.G. Giles, Ministry of Technology, GB

C.26 (8) The need and use of scientific and technical information in Finnish industry
Saima Wiklund and *Helka Hollmén,* The State Institute for Technical Research, Finland

C.31 (7) Scientific and technical organizations in the socialist countries – their relations to industry (in Russian)
Dionizy Gajewski, NOT Warszawa, Poland

C.33 (36) The personal responsibilities of the engineer and his organisation in utilisation of scientific and technical knowledge
G.F. Gainsborough, The Institution of Electrical Engineers, GB

C.34 (10) Publicity of information activities and the training of users of information
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C.43 (4) Technical information services in Canada
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C.44 (15) Technical information services in Denmark
Kjeld Klintoe, Danish Technical Information Service, Denmark

C.45 (23) Houses of Technology
M. Suska, Dom techniky, CSSR

C.46 (6) The idea, role and work of houses of technology in the Scandinavian countries
Morten V. Knudsen, Technological Institute, Copenhagen, Denmark

C.47 (27) The information system for science and technology of the industrial shipbuilding branch in the German Democratic Republic
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C.49 Technical information services in Italy (in Italian)
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C.52 Information activities in Portugal
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GROUP D

The aims, functions and organization of the information services in enterprises

D.0 (16) Scientific and technical information at enterprise level
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D.1 (21) Scientific and technical information services – significant part of the enterprise structure
Bart E. Holm, E.I. du Pont de Nemours & Co., USA

D.5 (11) Users of information in the enterprise
Odd Vattekar, A/S Nordisk Aluminiumindustri, Norway

D.6 (29) Certain problems faced in the training of users of information
Heinz Ziegler, Zentralinstitut für Information und Dokumentation, GDR

D.11 Description of and reflections on an information system established by A/S Nordiske Kabel- og Traadfabriker, Copenhagen
J. Veje Jensen, NKT Cable Works, Denmark

D.21 (5) The flow of information in the enterprise (small factory with developing production)
Eugeniusz Scibor, CIINTE, Poland

D.22 (22) Analytical studies of information profiles for the individual user of information in Norwegian enterprises
Arne Melsom, SNI, Norway

D.24 (17) The flow of information in the enterprise
W.E. Clason, NIDER, Netherlands

D.25 (32) Rationalization of operational systems of information under the aspect of concentration of science and technology
Klaus Neumann and *Peter Hommel*, Zentralinstitut für Information und Dokumentation, GDR

D.31 (28) House-documentalists work: its necessity and value
S.R. Ranganathan, DRTC, Bangalore, and *A. Rahman*, Andrew Yule & Co., Calcutta, India

D.33 (3) Information needs of trade unions
Wieslaw Sand, CIINTE, Poland

D.34 (20) Advanced methods of work – AMW (part of enterprise information system)
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E.1 Scientific and technical communication. A pressing national problem and recommendations for its solution
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Appendix II

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