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ABSTRACT

This collection of technical studies concerning the European Documentation and Information System for Education (EUDISED) presents the problems of educational information, documentation, and dissemination in Europe. In the first report, transmitter-receiver relationships and the understanding of each other's roles and needs are discussed. The second report presents current problems in the field of abstracting, indexing, and computer retrieval. The third report focuses on the problems of developing the multilingual EUDISED Thesaurus. In the fourth report, basic standards for an educational information network are discussed. The fifth report deals with non-book material, and problems in the standardization of recording mechanicisms are enumerated. The sixth report shows the problems of a decentralized network for educational information exchange in Europe. It goes on to fully describe the scope and goals of EUDISED and shows how its utilization will aid in the educational information problems of Europe. (MK)

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C O N T E N T S

DOCUMENTATION AND INFORMATION DIFFUSION ON EDUCATIONAL RESEARCH, DEVELOPMENT AND INNOVATION

by

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AUTHORS' PREFACE

This report has been prepared in accordance with the general guidelines issued by the EUDISED Steering Group in documents DECS/Doc (70) 27 and DECS/Doc (71) 1. This means that the examples and recommendations that are made on forms and techniques of documentation and information diffusion are based mainly on Swedish experience. Limitations of time and space have not made it possible to give detailed consideration to these examples. It is our hope, however, that they will be of some general interest and contribute to fruitful discussions on documentation and information diffusion.

SUMMARY

Information diffusion and documentation should be aimed at a broad participation in the process of educational planning and innovation. Communication between research and development on the one hand and users on the other, calls for an awareness on the part of the former of the R & D requirements of the educational system. The users for their part must condition themselves to assimilate information and to influence the orientation of research and development work.

This report is based (section 2) on a model, figure 1, which describes researchers' dissemination activities in terms of their involvement in the users' problems, and the active engagement of users to seek information and enhance their own preparedness for the utilisation of research and development results in education. The model also includes a third group with linking functions between the research side and the users. This linking function can involve a variety of roles, e.g. distributors, advisers, teachers, innovators and innovation leaders.

The transmitters (3) are described with regard to their function in the educational process - central institutions, research-producing institutions, local and regional research projects, often with a large proportion of teachers and individual innovators.

The receivers (4) may be other researchers, key persons within the central and local administration of education, teacher trainers, producers of educational materials and - a marginal group of great importance if the planning process is to be characterised by participation - teachers, pupils and parents.

The content of information (5) is classified according to chronological work phases from research need assessment via information on current research and development work to the accounting of concluded projects and secondary and tertiary collations of the results of development work. Content can also be classified as the results of research, evaluation, development work and as activity supplementary to research and development work as such.

The media of information transmission (6) are divided into four categories: dissemination through

(a) publications, pictorial aids and through personal contact networks

(b) demonstration

(c) training and further training of the users, and

(d) consultation, "running-in" and the evaluation of an innovation.

Particular emphasis is placed on the need for an efficient network of personal contacts and of secondary information, i.e. collations of research reviews and evaluating summaries of development work and experimental innovations. The various media of information can be accommodated in the model described in section 2 (figure 1).

In the concluding observations (7) it is emphasised that individual and intrinsically important efforts to create new forms and techniques for documentation and the diffusion of information on research and development work in the educational sector do not have their full effect unless they are integrated in a complete system which includes the sensitisation of researchers to educational research and development needs, the training of the users by demonstration and further training as well as consultation with researchers and innovators.

1. THE PURPOSE OF INFORMATION DIFFUSION

This report deals with forms and techniques for communicating the results of educational research and development work. Since communication is not a one-way process, i.e. does not solely entail the transfer of information from research and development work to schools and education, communication in the opposite direction should also be taken into account. This may, for instance, take the form of communication to educational researchers of information concerning the research and development needs of schools.

Since the communication dealt with here is, or ought to be, a stage of research and development work, the objective of communication should be subordinate to the object of research and development work itself. Communication is, therefore, an integral phase in the development of education towards the objectives laid down by society and in agreement with the demands made on education by individuals. Information diffusion is consequently a stage in the renewal of education, i.e. an important part of the process of educational innovation.

Thus the demands to be made on information diffusion can be derived from the strategy chosen for educational renewal. As has been observed by Per Dalin (1970), this strategy in turn is closely allied to the planning system applied to education. The conflicts and crises now affecting schools and universities prompt new forms of educational planning, planning through participation. The planner thus becomes more of an adviser, pointing out alternative futures to those involved, and delineating alternative goals and strategies for the educational system of the future. The kind of decentralised planning which this implies calls for planning procedures and planning techniques which are designed in such a way that they are not the

prerogative of the top administrators in the educational system. These procedures and techniques should be used throughout the educational system, for changes involve participation in decisions and in their execution and follow-up.

Summing up, we can point to two important demands concerning the communication of the results of educational research and development:

(a) communication must be a stage in the changes made to the educational system in order to improve its attainment of objectives and to elucidate various alternatives for a future educational system;

(b) communication must be arranged in such a way that the process of change does not become solely the concern of top administrators or central authorities within the educational sector.

Here communication has been principally regarded as a flow of information from researcher to practitioner or vice versa. The internal flow of information *within* research and development is, of course, extremely important, for knowledge will presumably be produced more efficiently if researchers are able to benefit promptly from their colleagues' results and without undue exertion or expense.

2. MODEL OF THE COMMUNICATION OF RESEARCH AND DEVELOPMENT RESULTS

The communication of information on educational research and development can be seen as a transfer of knowledge from its producers (transmitters) to its users (receivers). Thus, from the point of view of the producers (research and development) the communication process can be seen as diffusion of information, while from the receivers' point of view, it can be seen not merely in terms of reception but also as an active search for information. Thus, we are not concerned here with a one-way flow of information. Users communicate their need for information, research and development. A similar internal flow of information occurs within educational research. Since the purpose of the flow of information concerning educational research and development cannot be limited to this internal flow of information (see section 1), the content of this report will be primarily concerned with the flow of knowledge from research and development to the receivers, i.e. to practising teachers and school administrators.

Egon Guba (1968) has given an exhaustive description of a theory-practice continuum which, schematically speaking, is applicable to the flow of information on educational research and development. Guba distinguishes four phases in this continuum: research, development, diffusion and adoption. The emphasis in this report is on diffusion, but this cannot be properly understood in isolation from the other phases. A brief summary of the various phases is therefore necessary.

The fundamental aim of research is to produce new knowledge. This may be unsolicited or by commission. The object is to explain relations of various kinds which it may be possible to summarise in a theory which can be tested and, consequently, either confirmed or modified.

Development begins with the identification of a problem or need. Various proposed solutions are inventoried. Some of these may be applied unaltered while others have to be modified, revised or combined. If none of the solutions put forward is satisfactory, a new one must be devised. Many needs or problems require solutions in the form of materials, routines, procedures, etc. which have to be constructed and tested in a school environment before they can be adopted for general use.

The diffusion phase comprises the activity which causes a proposed solution or a new procedure to be brought to the notice of those who must be enabled to apply it in a practical context. Diffusion may proceed by means of the printed or spoken word, through conferences, conversations, etc. It may take the form of demonstrations in symbolic form (films, closed circuit television programmes, still pictures) or of authentic direct showing. Diffusion can also be achieved through consultation (problem-solving, "trouble-shooting") services, or by training either through *ad hoc* courses of varying duration or on a regular basis. In centralised school systems, diffusion is sometimes achieved by the nationwide adoption of new curricula, teaching aid systems, etc.

The introduction or adoption phase comprises the revision and installation of a problem solution or innovation in the individual local school environment. This is often preceded by an experimental period, modifications to what is to be introduced or to the school environment, training of the users, the acquisition of peripheral equipment, the running-in of new routines, etc.

How is the gulf between the generation and the application of knowledge, between research and practice, to be bridged? The two most interesting phases in this respect are development and diffusion. It should, however, be stressed that research is only one of the elements of successful development. Problem solutions in the school world are also very much dependent on a number of other important factors such as resources, previous experience, political conditions, institutional structure and so forth. Research should without doubt constitute *one* important factor in development and in the planning of changes to the school system. Great importance must therefore be attached to the efficiency of forms and techniques of information diffusion.

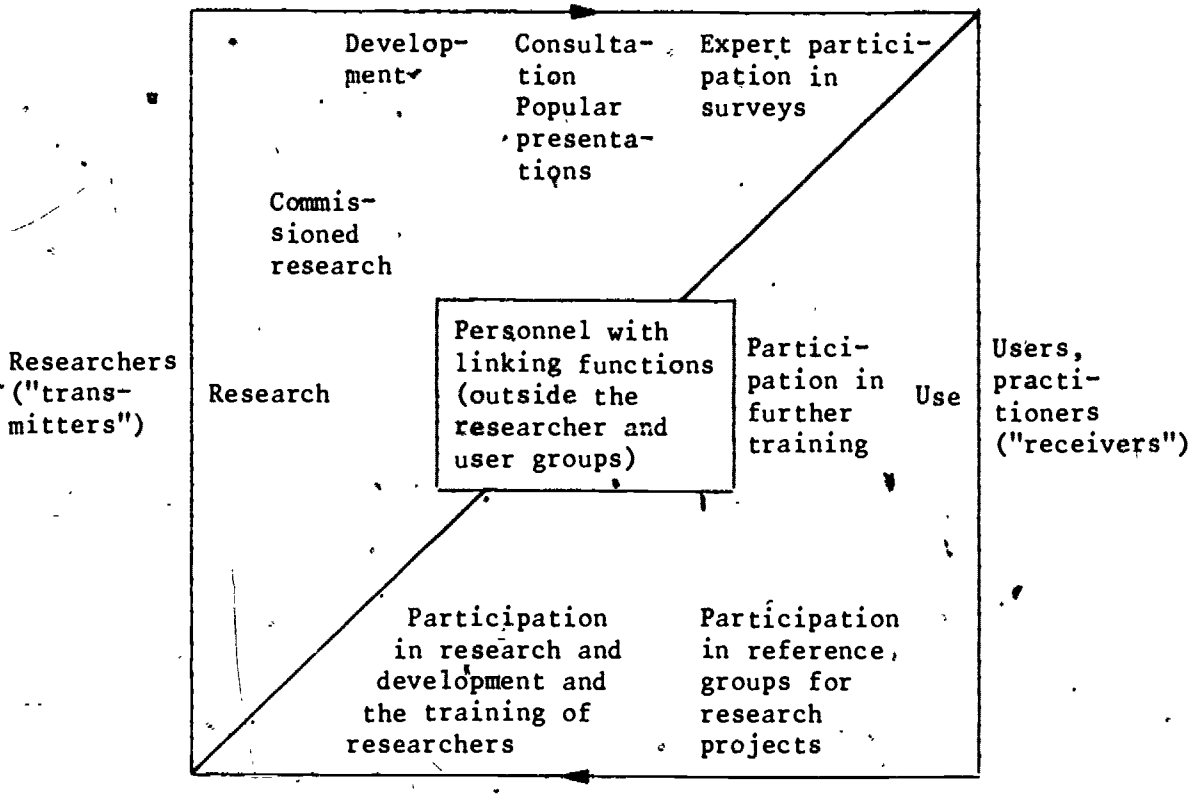
The following argument is based on the diagram in figure 1.

Reading the diagram from left to right, we move along the theory-practice continuum from research via commissioned research, development and diffusion to the practical use of research and development results in education and educational planning. Thus, on the left of the diagram we find researchers as producers of knowledge of "transmitters" (note that intercommunication also occurs between "transmitters").

To the right in the diagram we find the users, i.e. educational administrators, teachers, pupils, educational policy-makers, etc.

Research is represented by a triangular area, the apex of which is directed towards the users. This implies that researchers can be involved

Figure 1 - *The research and development continuum*



in development, the diffusion and utilisation of new knowledge, the latter, for example, by participation in surveys and as experts connected with educational planning.

Similarly, users are represented by a triangle the apex of which points towards the research side, thus implying that users can with varying degrees of involvement participate in research and development as well, the latter, for example, being the case with teachers who are trained in educational research by collaborating in research and development projects. Thus the triangular areas represent personnel in transmitter and receiver categories respectively. These categories are described in section 3 (transmitters) and in section 4 (receivers).

The rectangle inserted in the diagram covers parts of the development, diffusion and utilisation phases and refers to special personnel with linking functions. R.G. Havelock (1968) has exhaustively described "linking roles" between researchers and users. The following is to a certain extent based on havelock's typology. Whereas the triangular area implies that transmitters and receivers respectively play an active part in the communication process, the rectangular area denotes functions discharged by special personnel outside the transmitter and receiver categories. The following subordinate groups can be distinguished:

	Role	Function	Examples
(a)	distributors	the transfer of knowledge, mainly in unprocessed form	documentalist; specialised journalist (e.g. in the educational press); producers of educational materials, often via their sales departments; educational advisers (central, regional or local); research secretariats (research secretaries)
(b)	advisers	helping users to identify problems and possible solutions	educational advisers
(c)	teachers	to disseminate knowledge of the current state of knowledge within a broader educational field	methodology tutors; further training consultants; teachers at R & D schools
(d)	innovators	to disseminate knowledge of educational innovations	specially appointed directors of studies; R & D teachers; further training consultants
(e)	leaders	to bring about liaison by virtue of influence, example or management of the individual school etc.	head teacher; director of studies; head of department

The diagram given as figure 1 is the foundation on which the following argument is based. Thus the transmitter side is dealt with in section 3 (research institutions, development work based on experimental schools, regional educational laboratories, Institut National de Recherche et de Documentation Pédagogiques, National Foundation for Educational Research, etc.). The receiver side is specified in section 4. Since educational research and development should be interpreted in a broad sense, as was pointed out in section 1, we have attached importance to the closer consideration of the various categories of information which should be included in an efficient system of information. This is done in section 5.

The main section (6) of the report deals with different media or forms of information diffusion with reference to the diagram in figure 1.

3. TRANSMITTERS

3.1 *Central institutions*

The institutions producing the knowledge that is needed for the development of the school and educational system can cover an entire nation or State, as for example in the case of the Institut National de Recherche et de Documentation Pédagogiques in France, the Paedagogisches Zentrum in Germany, the Schools Council in England and Wales, the National Board of Education in Sweden (above all through its research and development section), the Norwegian Educational Experimental Council and others.

Institutions of this kind often commence their activities with needs inventories and objective analyses, which are generally recurrent and constitute a stage in the establishment of a research and development policy for the institution in question. Research and [illegible] must be based on a policy, an objective for schools and educational activity. But the institution and its officers are not always aware of this policy. It may be tacitly understood and unquestioned, ostensibly on account of the complete independence and objectivity of all research.

Consequently, the principal tasks of the central institutions are to plan, administer, allocate funds and tasks, attend to matters of central service, documentation, information and communicaton, all this with the aim of increasing the recipient's knowledge of this information and improving the fulfilment of objectives.

Central institutions of this kind can, of course, carry out certain parts of their research and development programmes themselves. As a rule, however, they commission the greater part of their research and development programmes from specific research establishments. These may be directly subordinate to the central institution, as is the case with the Swedish schools of education.

We shall return in due course to consider the content and forms of informative activity conducted by these central transmitters.

3.2 *Research institutions*

The level immediately below the central transmitting institutions described above is represented by individual research institutions, e.g. the educational and psychological institutes of universities and colleges. The boundary between these and the national or State institutions mentioned earlier can fluctuate, but as a general rule research institutions are directly concerned with research work, either in the form of defined and concentrated projects or as independent tasks performed by individual researchers.

The work of the research institutions - and accordingly the products of that work which may need to be passed on to schools and the educational system as a whole - can cover the entire school system, ranging from free and independent research to commissioned research with more closely defined objectives.

The staff resources of the research institutions can vary. The individual institution may be profoundly influenced by the preoccupations of its head or by the research expertise which has gradually come to be concentrated there. Most institutions also have the task of training researchers. Project work, either in the form of commissions or projects mounted by the institution itself, is normally performed by post-graduates or other students training for research. This leaves a considerable mark on the products and informative material which subsequently have to be communicated to school officers. The exactitude and exhaustiveness which for researchers are a matter of principle, often make their reports both abstruse and ;rous to school officers. This is a problem which needs closer study. ;ome instances it has been found advisable to report on two levels, with a thesis produced for the narrow circle of scientific practitioners and a more easily assimilated work designed for educational practitioners.

Research institutions can also discharge a special, clearly-defined function and may even have been set up for that very purpose. This is, for instance, the case with the research and development centres recently set up in the USA and financed by federal grants. A centre of this kind may have been assigned a particular problem sector to work on. Thus work may be viewed as a single project or as a group of closely related projects. Production here may take the form of special informative publications and series of reports. Some centres publish periodical reports or annual bulletins.

The Regional Educational Laboratories set up to promote and develop the schools of a particular region or a particular type of school can be seen as a variant of the research and development centres. Work at these laboratories is above all characterised by association with regional and local school problems and by the important role of further teacher training and conferences as a medium of information.

Neither research and development centres nor regional educational laboratories are as a rule concerned with the training of researchers. While this relieves them of a host of burdensome routine tasks, it is liable to isolate them from the reality they set out to serve and so limit their diffusion of information to and communication with presumptive receivers.

Generally, one can say that commissioned research is more concerned than other kinds of research with a pre-determined type of product, e.g. a particular publication or educational material prototype for a specific target group (though, of course, the *results* communicated by this product can never be predicted as long as research remains objective). Commissioned research is also aimed at practical results and consequently can often be transformed, even within the context of a commission; from what is termed research to what is termed development. An educational material prototype, a methodological direction, an evaluation instrument or an organisational model for teaching can constitute the result of such development work.

Modern educational research is often linked organisationally with development, e.g. for the production of method-material systems. Nowadays it is common practice for research institutions at universities and schools of education to augment their research programmes with a development phase, thereby going so far in their construction of prototypes as to guarantee

communication with educational suppliers and teachers. This helps to bridge the gap which has so often existed between research results and practical utilisation.

The six educational institutions of the Swedish schools of education resemble the Regional Education Laboratories in that each of them has been assigned a region within which to support regional and local development in the school system. Further training for teachers is similarly divided between these six regions and is centred on the further training departments of the schools of education.

State-sponsored development in Sweden also includes the construction, testing and standardisation of instruments for evaluating the activities of schools, above all as regards Swedish, English, German, French, mathematics, physics, chemistry, economics and technology.

3.3 *Local and regional experimental projects*

Transmitters of information on schools and development have also come to include certain municipalities or groups of municipalities (regions). A number of local and regional experimental initiatives in Sweden have recently attracted notice and have been subsidised from government funds. This work has been of a predominantly practical nature, aimed at the development of routines, work programmes and patterns of organisation designed to achieve the underlying intentions of the new schools. Tests have been conducted of different applications of the new curricula, new types of school buildings, new allocations of teaching time replacing the traditional periods, new constellations of subject matter in place of the traditional subjects, new groupings instead of the traditional class and so forth.

The experience gained in these "experimental blocks" has first and foremost benefited the teachers immediately concerned. But reports and work programmes have also served to disseminate it further in generalised forms. The educational institutes of schools of education have often been engaged during the final phase of specific experiments to obtain the assistance of their scientific expertise in evaluating the experiments. The information generated by this activity includes further training programmes for teachers, the production of educational material prototypes, study programmes, inventories of teaching aids, evaluation instruments and objective documentation.

3.4 *Private development work*

Producers of textbooks and other educational materials have long been conducting their own development work. This has above all been concerned with the practical use of books or sections of books in teaching. Educational publishers have engaged individual teachers for tests of this kind and have based the final design of their products on the results of such tests.

Owing to the increased demands placed on educational materials, above all as regards the integration of separate materials into a system with textbook, audio-visual material, teachers' manuals, pupil booklets and evaluation instruments constituting an integral whole, educational suppliers have tended more and more frequently to engage educational and scientific expertise.

Thus in recent years they have engaged the educational institutes of schools of education for qualified and controlled testing. Producers have had to address themselves to the in .itutes as such and reach agreements with them concerning the nature and scope of testing. Thus it is no longer possible for them to engage individual researchers during their spare time.

Experience of this kind of commissioned research is still quite limited. It is to be expected that these activities will expand. There is therefore reason for a more systematic appraisal of the experience gained.

3.5 *Demands on transmitters*

Two principal demands are made of the transmitter, namely:

(1) he must realise that his task is to communicate information not only to fellow researchers (at home and abroad, in his own language and in an international language) but also to a number of other recipient groups, and

(2) that different recipient groups have different requirements concerning the form and content of information, according to their own tasks.

4. RECEIVERS

In the previous section we considered certain members of the transmitter group, namely central research and development institutes and the research institutes of universities and colleges. Another special group of research institutions to which we have already referred is that of special research and development centres and regional educational laboratories. We have also seen how municipalities and groups of municipalities, often collaborating with educational research expertise, have come to operate as transmitters of information. The same is now true to a certain extent of producers of textbooks and study kits.

We turn now to consider the *recipients* of this information.

4.1 *Information to other researchers*

Research results have to be critically appraised by other researchers, in order to promote further scientific development. This is the classical pattern of the diffusion and receipt of research findings, namely communication by one researcher to another.

This remains both valid and important. We must never compromise in our demand for correct and complete information, no matter how indigestible it may be to the layman. But nowadays, it is no less important for the knowledge and information produced by research to be made available to others besides researchers. This "translation" of theoretical knowledge into practical action is, in the long term, a condition for the survival even of science in the narrower sense.

To this must be added the fact that the scope of contemporary research is so wide that even the trained scientist needs help in the form of summaries, surveys and classifications of research data. Thus even the narrow circle of researchers needs more than primary material such as theses and research bulletins. The mass of information must be processed into abstracts, provided with reference headings, catalogues and classified. It must also be made more accessible - even for the researcher's benefit - than it is when merely accommodated on a shelf in the researcher's library. It must be presented in one or more languages known to the majority of researchers, and so on.

4.2 *Key persons in schools and education*

The main recipients of research and development results include educational planners and central administrators, as well as decision-makers at regional and local level within the educational system. This group also includes qualified expertise within educational administration, e.g. educational advisers and curriculum designers.

As we shall see, popularisation or dilution of research results is not enough. (This practice must also be attended by caution, to avoid misinterpretation and misuse of information.) It is extremely important that the key persons acquire a capacity for receiving and interpreting information. Without this capacity they will soon develop into formalists and bureaucrats, and perhaps be more of a liability than an asset to the cause of educational progress.

4.3 *Teacher trainers*

Another closely related group of key persons is made up of those responsible for the basic and further training of teachers. Teacher trainers tend to hold on to well-tried methods and to be reluctant to take the risks involved in experimenting with new ones. They must be made to realise more than they have done hitherto that there is no overall methodological solution, no reliable method which the new teacher can apply for the rest of his active life. Teacher training must emphasise the supreme importance to the new teacher of a capacity for eliciting techniques credited with a universal and permanent value must be replaced by the appraisal, evaluation and application of methods and materials.

To satisfy this requirement, the teacher trainer must keep abreast of new developments in education. And he must not restrict his attention in this respect to a single subject or pupil category.

The Swedish practice of combining teacher training with educational research and development at schools of education is designed to facilitate daily and living communication between the two. Teacher training includes a study, albeit on a limited scale, of the research and development work in progress at the school of education.

Innovation is generally noticed more promptly in the further training of teachers, the reason being that it is easier to engage specialists and researchers of various kinds in this context. It is therefore important for further training schedules to be co-ordinated into homogeneous programmes to

prevent innovations appearing in the guise of isolated novelties. It is also important for research and development results to be studied in detail and presented in further training programmes which can be easily applied to teachers. This conversion process has been found in Sweden to require a great deal of personnel or personnel groups incorporating both scientific-theoretical and practical-educational expertise.

4.4 *Educational suppliers*

We saw in the previous section that educational suppliers can be expected to develop into a group of information transmitters when tests on new educational materials have results that are susceptible to generalisation. Even today, it is quite obvious that producers of educational materials are in great need of access to research and development data. Above all, they need to be able to follow the model and prototype development of educational materials from an early stage.

This contact work has on various occasions been affected by technical problems and copyright questions which can make it difficult to give the representatives of a market-controlled educational materials industry complete freedom of access to research and development projects. Joint committees have been set up in Sweden by the Research and Development Bureau of the National Board of Education and representatives of educational suppliers, with monthly meetings being held to keep the suppliers informed of current research and development projects.

4.5 *Teachers, pupils, parents*

Last but not least in this schedule of information recipients one should mention those directly involved in education, namely teachers and pupils together with parents and the rest of the interested general public. Information on research and development results reaches these receiver groups indirectly by means of new curricula, new educational materials and new organisations and routines in teaching but also directly in the form of reports and articles in periodicals. The importance of this information should not be underrated, even though its recipients are less frequently classifiable in the category we have designated as key persons. Active interpretation of objectives and curricula is a long-term condition for the involvement of teachers, pupils and parents in school development.

In the case of these target groups it is not enough for information to be easily accessible and assimilable. Often the problem lies in making a judicious selection from the great mass of information available.

4.6 *Demands on the receiver*

In the preceding sections we have enumerated various transmitters and receivers of information concerning educational research and development. In so doing we have assumed that this information exists in one form or another and that it needs to be conveyed from the transmitter to the receiver. How is this to be done? From what we have already said, it is evident that certain conditions have to be satisfied.

One should expect of the *receiver*

(1) that he will not normally obtain the information he needs without actively searching for it and that he must acquire a capacity to search for it, and

(2) that he will convert this knowledge into some kind of activity, which may involve either the interpretation and further communication of information to persons in key positions and others directly involved, or alternatively the evaluation by key persons of that information, possibly resulting in action.

Thus transmission without the prior definition of a target group is liable to fall on deaf ears. This has often been the case with scientific works, which have been published only to gather dust on bookshelves. If the matter transmitted does not reach the recipient for whom it is intended, there is no receiver and, consequently, no information. Thus successful transmission of information requires that transmitter and receiver have a similar interest in deriving benefit from the knowledge concerned. They must be able to talk to each other. We are concerned therefore not only with information but also with *communication*. This communication works best if transmitter and receiver experience the same or similar needs for research and development work.

5. CONTENT

The content of information communication can be grouped according to the work phase or time dimension of development work: from needs inventorying via interim reporting to final reporting and the secondary information in the form of research surveys based on it. The content of information can also be grouped according to the nature of research and development activity, e.g. research, evaluation, development and various activities ancillary to research and development.

5.1 *Grouping by work phase*

5.1.1 *Needs inventorying*

One important task must therefore be to investigate research and developmer needs. Investigations of this kind have been carried out in a variety of contexts. One example is provided by the annual needs catalogue that has been compiled in Sweden during the past few years by the Research and Development Bureau of the National Board of Education. Suggestions for research and development projects are collected from each of the bureaux of the Board. These proposals are grouped by department and passed on to the Research and Development Bureau, certain proposals being deleted while the remainder are ranged in order of priority. Meantime a similar inventory is made by the teachers' organisations and a number of educational suppliers. All these lists are collated by the Research and Development Bureau to form a joint needs list, which is then sent to the educational research institutions (and certain institutions of behavioural science) of the schools of education and universities. These institutions in turn examine the lists and append proposals of their own The lists are then

returned by the institutions to the Research and Development Bureau, which draws up a final needs catalogue of urgent research and development projects, grouped according to school level, subject and type of problem. Priorities are then determined within each of these categories.

This needs catalogue is reviewed by a special group comprising the departmental heads of the Board, who draw up a list of projects on which to base their budget proposals to the government and Riksdag. When the appropriate grant has been made, the funds available are divided between different research and development projects. Most projects are assigned to interested research institutions, in which case money is allocated for commissioned research according to special regulations.

5.1.2 *Current research*

The same section also compiles a catalogue of current research projects which includes both projects financed by the Board of Education and those financed from other sources. The 1970-1971 catalogue of current school research contained 190 projects. Most of these were on a minor scale, e.g. M.A. theses.

5.1.3 *Final reports*

Reports are issued on major research and development projects at the conclusion of every phase. A final summary report is issued when the project is complete. A financial report is submitted annually to the granting authority. A summary interim report is generally given on every major project once a year in the form of a school research newsletter of about ten pages.

5.1.4 *Surveys of concluded research projects*

Critical analyses of different problem sectors are compiled on the basis of research reports, monographs, articles in periodicals, etc. These analyses describe among other things the current state of research, thus providing a basis for the assessment of research requirements. Critical surveys of research provide the links in the chain formed by needs inventorying, reports on current research and final reports.

Every year the Swedish Council for Social Science Research compiles a catalogue of concluded educational and psychological research. The 1969-1970 edition of this catalogue enumerated 260 projects. This compilation, like the catalogue of current research mentioned previously (5.1.2) covers the entire country. Certain individual research institutions publish their own annual reports, while bibliographical reports on publications in the field of educational research and development are compiled at regular intervals by publishers and specialised libraries.

5.2 *Grouping by activity within research and development work*

The content to be communicated from transmitter to receiver can vary in character. The following is an example of catalogue classification.

Main group	*Sub-group*
Research	Basic research Commissioned research
Evaluation	Evaluation of curricular alternatives Individual evaluation Systems evaluation Educational material testing
Development	Method development Product development
Auxiliary research functions	

Research and development can thus be categorised in four main groups, namely research, evaluation, development and auxiliary functions. Regardless of which of these main groups one may emphasise most, all four groups are of importance for the transfer of information from transmitter to receiver. (*cf.* section 7, Recommendations.)

One example of a project coming in the *basic research* group is a project on multi-channel learning for pupils with reduced vision, which is concerned with certain basic questions of the psychology of perception. The sub-group *commissioned research* includes a project for the development of models for allowance for individual differences in teaching.

The group headed *evaluation of curricular alternatives* includes a comparative study of alternative presentation and study models regarding the learning of languages. Evaluation projects of an *individual* character can refer to studies of new prototypes, evaluation methods for subjective assessment and methods for the assessment of written composition. *Systems evaluation* generally involves major projects of a cross-sectional or follow-up character, e.g. the effects of school structures on pupils' study options. The *testing of educational materials* can entail various kinds of comparative studies of educational material prototypes.

These last-mentioned activities are closely connected with development projects. The latter can be concerned with *method development*, which often includes syllabus development. They can also be concerned with *product development*. One example of this is the major Swedish project for individualised mathematics instruction in grades 7 - 9 (IMU).

Auxiliary research functions include the development of new computer programs, new observation schedules and new questionnaire forms.

6. INFORMATION TRANSMISSION MEDIA

Forms and techniques of information communication can on the basis of the diagram in figure 1 be divided into four categories:

- diffusion through publications, pictorial aids and personal contact networks (6.1);
- diffusion by demonstration (6.2);
- diffusion by the basic and further training of the users (6.3), and
- diffusion by consultation, "running-in" and evaluation (6.4).

Section 7 contains recommendations for a more efficient communication of information concerning the results of educational research and development.

6.1 *Information diffusion*

Information diffusion in its true sense, i.e. the transfer of information in a relatively unprocessed state, without any transformation by "linking personnel", can be said to include printed communication (6.1.1), communication through audio-visual aids (6.1.2) and communication through networks of personal contacts (6.1.3). Each function can be illustrated by different forms which in turn may have different organisational foundations. The organisational forms are summarised in 6.1.4. Computer-based information systems of various kinds are not specifically dealt with in the following since this has been done in other reports to EUDISED.

6.1.1 *Communication of printed information*

Printed information can be classified on a scale ranging from indexes, lists and inventories via summaries and abstracts to exhaustive reports and monographs. It can also be classified according to the target group for which it is intended, ranging from scientific presentations via popular transformations by researchers to reports and summaries aimed at a wide audience.

A. *Indexes, lists, inventories and catalogues:* Indexes or catalogues of current educational research or initiated research projects are published regularly, e.g. in the USA and Sweden. The Swedish catalogue of current educational research is published annually and includes all current research projects on a certain scale. One American documentation service is the School Research Information Service (Phi Delta Kappa). In the USA, Phi Delta Kappa has also published inventories of current research, e.g. *Research Studies in Education 1968, Subject Author Index* and *Research Methods Bibliography (1970). Behavioural Sciences in Progress* has a wider coverage with some 8,000 annual summaries of current research projects, published by the American Psychological Association with summaries provided by the Science Information Exchange of the Smithsonian Institution. Current educational research in France is listed in *Sciences de l'Education, Recherches en cours, France* (Centre de Documentation Sciences Humaines). Inventories of current research have been published in the Federal Republic of Germany and in Great Britain (EUDISED 1969, vol. 2). A list covering the whole of Europe was published by the Council of Europe in 1968 (new edition in preparation 1971).

Lists of articles published in journals can specialise in the educational sector, in which case they include not only research and development but all articles dealing with education. Lists of this kind include the American *Current Index to Journals in Education* (ERIC), *Education Index* (New York) and the *British Education Index*. Articles are also listed in concise bibliographies, which also include references to monographs and reports. Most European countries also have general indexes of periodicals not specialising in education.

Lists of reports are published regularly in the USA in the publication *Research in Education* (ERIC), which also contains summaries of the contents of reports. Lists of research reports are also published by the Research and Development Bureau of the Swedish National Board of Education.

Lists of books in the educational sector are to be found in the national bibliographies, e.g. *British National Bibliography, Biblio, Deutsche Bibliographie, American Book-publishing Record*, etc. Printed library catalogues, e.g. union catalogues of new acquisitions by groups of libraries, also contain lists of monographs on educational research.

A special documentation of current educational material production has been developed in the USA and France. A monthly publication issued in the USA, *EPIE Forum* (EPIE = Educational Products Information Exchange) contains both producer and analytical information. Experiments are being made in France with computer-based lists (EUDISED 1968, vol. 2).

Finally, mention can be made of lists specialising in education and containing references to articles, books and reports alike. Mention can be made here of the German *Bibliographie Pädagogik* (EUDISED 1968, vol. 2) and the French *Bulletin Signalétique* together with the now discontinued annual bibliography published by the International Bureau of Education.

B. *Abstracts:* Concise descriptions of recently initiated projects are given in the monthly publication *Research in Education* (ERIC), which also contains a subject index and project descriptions. Summaries of current projects in the educational sector are published annually in the Swedish *Katalog över pagående skolforskning* (Abstracts of Current School Research), which is printed in Swedish. A full page description is given of each research project or major research task, with details concerning purpose, method, sample population, time schedule and finance. A similar arrangement is practised in the Council of Europe publication *Education Research: European Survey, 1968*, a new edition of which is to be published in 1971.

Summaries of reports are published in the American journal *Research in Education* mentioned previously, which also contains subject, author and institutional indexes. This publication also includes a certain proportion of foreign reports. The Research and Development Bureau of the Swedish National Board of Education runs a report service organised on the following basis. Report titles together with a few lines summarising the content of recently published reports are given in the *Educational Journal*, which is published eight times a year. Readers can then fill in a special reply card to order a more extensive summary, running to 1 - 5 typewritten pages, of the reports which particularly interest them. Some weeks after the publication of each issue, the *Educational Journal* publishers pass on the reply cards

thus received to the Bureau of Research and Development, which in turn sends the more exhaustive summaries to the readers ordering them. Those interested can apply to the Bureau for the complete text of a report to be sent to them direct from the research institution involved.

Summaries of material concerning educational research are also provided by journals with a wider field of reference, e.g. *Psychological Abstracts* and the publication *Dissertation Abstracts*, which are both American.

The now discontinued series of annual bibliographies published by the International Bureau of Education also contained brief summaries of the literature listed.

Abstract publications specialising in the educational sector include *Educational Administration Abstracts*, *Sociology of Education Abstracts*, *Technical Education Abstracts* and *Language Teaching Abstracts*.

Abstract publication in the field of education today can be fairly described as inchoate and erratic. Some sectors are well observed and the abstract publications which cover them make a consistent selection. In other cases, the scope is far too wide owing to lack of critical selection, with the result that reference without any eliminating criteria produces an excessive proportion of irrelevant material.

C. *Research surveys:* The critical summaries provided by research surveys are a particularly valuable form of information communication regarding educational research and development. Pride of place is here taken by the *Encyclopaedia of Educational Research* and the hitherto quarterly *Review of Educational Research.* Revised editions of the former (fourth and most recent edition 1969) have provided an up-to-date research survey with special emphasis on Anglo-American (above all American) literature on educational research. There is no European counterpart to these publications. The *Review of Educational Research* has presented surveys of current research in a variety of major sectors (pre-school teaching, the teaching of languages, etc.). This coverage is now to be given the form of a year-book.

A research survey by R.H. Thouless entitled *Map of Educational Research* (National Foundation for Educational Research) was published in Great Britain in 1969. This presentation is intended for a wider circle than that of educational researchers and represents an attempt on the part of researchers to adapt the production of knowledge to suit a broader public. A similar aim is embodied in *Educational Research in Britain* of which two volumes have so far been published. An account of child and adolescent psychological research was published in France in 1968 by the Institut Pédagogique National.

There are a host of specialised research surveys, among them J.A. Harrison's edition of *European Research in Audio-visual Aids*, K.G. Lumsden's *Recent Research in Economics Education* (1970) and R.B. Ashlock's *Current Research in Elementary School Mathematics* (an anthology of articles) 1970.

D. *More detailed descriptions and accounts of research:* Publications of this kind take the form of articles in scientific journals, monographs, reports and microfilm editions of dissertations.

Professional journals are indispensable for a concise scientific account of current research and for a continual critical appraisal of methods and results. One example of a journal of immense value in the communication of information from research to practice in educational planning, administration and schools is the English publication *Educational Research*, issued by the National Foundation for Educational Research. The articles included in this journal often refer to a particular problem of current interest, e.g. individualisation, spelling or listening. Articles contain resumés of research to date as well as of surveys and experiments conducted in English schools. *Revue française de Pédagogie* is organised on much the same lines. American journals with similar contents include the *Journal of Research and Development in Education* and the *NEA Research Bulletin* (Washington). In many other countries, including Sweden, there are no publications with this specific aim, although the need has long since been pointed out.

A more detailed but rapid professional account of research results is also provided by reports and dissertations. In this respect price of place is taken by the American report service run by ERIC. The monthly list *Research in Education* (see above) contains summaries of reports together with exhaustive subject, author and institutional indexes. The full texts of the reports are available in micro or fascimile editions. One's view of this service as a means of heightening the efficiency of the flow of information from research to practice is probably dependent on the cost factor. Perhaps it is to be expected in the first instance that a reporting service of this kind will be confined to the limited public comprised by research institutions and specialised libraries. A system like the American ERIC is, however, indispensable for making academic dissertations, which are frequently unpublished, available to a larger circle of researchers.

Monographs (printed books) are a form of information communication that necessarily aims at a more definitive account of results that can be expected to remain current for a longer period and which do not have to be published so promptly. On the other hand, paperbacks can be produced relatively quickly and less expensively, which makes it possible for them to reach a larger public. Results of more general interest obtained in school research projects commissioned from the educational institutions by the Swedish National Board of Education are published in pocket editions. Thus a volume has recently been published covering the project *Education in the Year 2000* together with projects on instructional methods in the teaching of German, which were concerned with a methods and materials system for the upper level of comprehensive school.

E. *Summaries in handbook form:* It is possible to distinguish between two types of handbook. One group specialises in summaries by researchers for researchers of results from sub-sectors, e.g. regarding teaching methods, statistical analysis, measurement theory and suchlike, while the other group is aimed more at users outside educational circles. Of course the latter can also be useful to researchers. This latter group, which is the main object of interest in the present report, can be said to include the *Encyclopaedia of Educational Research* and its counterparts in other languages. A

distinctive feature of this valuable means of communicating information on educational research and development is that it dates relatively fast, but it must nevertheless be regarded as a particularly valuable component of an efficient system of information, by virtue of the lucid overall perspective it provides.

F. *Concrete summaries with aspects of application:* An interesting example of an attempt to transform research results into a product that can be used by the teacher in the classroom is the US Office of Education's series of PREP (Putting Research into Educational Practice) monographs. One of the most recent monographs is entitled *Correcting Reading Problems in the Classroom* and sets out to help the class teacher, who is the first person to notice the pupil's reading problems, to correct these problems in class, rather than send the pupil to a specialist.

A similar aim, though on a more modest scale, is embodied by the pocket books published in the course of research and development work commissioned by the Swedish National Board of Education. This Board also publishes a journal entitled *PM från Skoloverstyrelsen* (Memorandum from the National Board of Education) which provides teachers with an account of current developments.

The kind of information communication represented by PREP lies midway between more popular monographs and the type which we shall now turn to consider, namely the communication of research and development results in specially packaged forms, e.g. educational material together with appurtenant components such as tests and teachers' instructions.

G. *Study kits and teachers' instructions:* Apart from reports and monographs, the results of educational development are also communicated more directly in the form of products. This is done, for example, by research and development centres or regional educational laboratories in the USA and by research institutions attached to schools of education in Sweden, etc. Since the very structure of development work is aimed at the communication of information, any extensive exemplification here would be superfluous. Instead we may content ourselves with one example from a small three-year project commissioned by the Swedish National Board of Education on the subject of ADL (Adjustment to Daily Life) training in special schools for the mentally retarded. The basic research, which included literature studies and observations, the compilation of timetables for a suitable learning schedule, etc., was translated into a training programme. This is documented in a written manual for remedial teachers containing instructions, observation schedules, etc., a filmstrip (see below for audio-visual aids and information techniques) for training remedial teachers and a film describing theory and teaching methodology.

H. *Inventories of educational research needs:* We have already had occasion in this report to emphasise that the flow of information should not be viewed as a one-way communication from research to practice: it also involves communication of the needs and desires of practitioners to the researchers. P. Dalin (1970) has stressed the importance of large groups within the educational community being able to participate in planning. The same should also apply to research and development, which means that research requirements should be inventoried over a broad compass. Research councils,

authorities and research associations have in various connections drawn up more or less exhaustive inventories of research requirements or indicated priorities for planning new research. One example of inventory procedure is the catalogue of research needs compiled at the Swedish National Board of Education. Inventory work begins with problem identification in questionnaire form and by means of interviews and conferences on a minor scale. The written questionnaire is a form which the respondent can complete to specify an important problem or problem sector which should be made the subject of research and development work. Respondents can also give a more detailed specification of questions or subsidiary problems, indicate the groups concerned within the educational system, the nature of the problem according to predetermined categories, and references providing a closer description or motivation of the problems. The target groups for these questionnaires have comprised central and regional school administration, particularly subject and grade specialists in teaching and pupil welfare, together with consultants for teacher guidance and further training. The completed questionnaires are then collated in catalogue form, whereupon the problems are categorised and grouped into major sectors. A summary document is compiled on the basis of the catalogue setting out research and development needs in various major fields, e.g. research into objectives, pupils, teachers, teaching, educational materials and evaluation. This document also includes a comparison of current research and needs within the various fields. The summary thus made provides the basis for a definition of immediate and more long-term research and development requirements.

The results of the needs inventory are forwarded to the research institutions, who in turn interpret the requirements and transform them into project plans, often in collaboration with those participating in the inventory of problems.

I. *More popular surveys and summaries produced outside research circles:* The educational press and parent-teacher association magazines include regular surveys entitled "The Field of Research", "What does Research have to say about ...", "Research and Progress" and so on. Popular summaries of educational research are also found in general educational periodicals such as *American Education*, *l'Education Nationale*, the Swedish *Utbildningstidningen* (Educational Journal) and the English *Times Educational Supplement*.

Specialist professional journalists capable of recasting scientifically presented information in a form which is accessible to a wider public are very much in demand. They must have a close knowledge of educational matters together with a certain basic scientific education to enable them to maintain the necessary standard of critical discrimination in their articles. There are specialist science reporters in the natural sciences: similarly research institutions, at least those engaged in development work, should have editors or journalists to make the flow of information accessible.

6.1.2 *Information diffusion using audio-visual aids*

Apart from verbal or computerised reporting, a research project is often documented in pictures. Motion pictures and closed circuit television recordings are used for this purpose as well as still pictures. Thuse closed circuit television is installed at the Swedish schools of education, which

train teachers for primary and secondary schools, and closed circuit TV programmes are produced for teacher training and are also coming to be used for micro-teaching. School research projects are conducted on behalf of the Swedish National Board of Education at the research institutions attached to the schools of education. In order to communicate the results of these projects to teachers undergoing basic or further training, closed circuit television recordings are made to illustrate methodology, field experiments, details of lessons, the use of educational materials, etc.

Regular nationwide radio and television broadcasts also include programmes which acquaint teachers with current developments, further training materials and educational research and development work.

Similarly, it is a matter of course for individual educational suppliers to utilise audio-visual media for information on teaching aids. Presentations of this kind may be concerned with a particular aid, its components and use, or with research results obtained in field experiments during the formative testing of the material.

6.1.3 *Information diffusion by networks of personal contacts*

In figure 1 and the comments made upon it, emphasis was placed on the personal network of contacts including researchers and practitioners. The latter may be politicians, educational planners, teachers, etc. The purpose of the personal contacts dealt with in this section is diffusion. Teacher and consultant roles are dealt with in 6.2 and subsequent sections.

A temporary form of contact is provided by conferences between researchers and educational practitioners. These conferences may serve to confront "the field", its needs and desires with the resources and knowledge of the researchers. Often the current state of research is reviewed with reference to a particular question that is due for consideration and decision. Conferences of this kind can give both decision-makers and practitioners impetus in their respective sectors of activity.

More permanent contacts between researchers and decision-makers are established by the inclusion of researchers as experts on government committees or in national or regional authorities (on this see Wall, 1970). In Sweden the reforming decades 1940-1970 have been marked by the interplay between politically composed committees and researchers or groups of researchers seconded to those committees as experts. A more permanent form of collaboration in connection with the research commissioned by the Swedish National Board of Education is provided by the special Committee on Educational Development and Experimental Activities, etc. set up in the mid-1960s and which is still in existence. Advisory groups of researchers will probably also be attached to the National Institute of Education now being planned in the USA.

Commissioned research naturally requires an efficient network of contacts. This is illustrated by the forms of research commissioned on behalf of the Swedish National Board of Education. Research and development programmes are generally assigned to an educational institution at a school of education or university. The intentions of the sponsor are represented at "user level" by the officers at the National Board of Education who are

concerned with planning, teaching and teacher training. These may be school consultants representing a particular subject or school level, inspectors of upper secondary schools or heads of sections or bureaux. Two liaison officers are appointed from this group for each project and are included in the reference or advisory group attached to the research group (project group) at the scientific institution. This reference group also includes experts and representatives of "users" outside the National Board of Education. The liaison officers' collaboration with the project groups is led by three officers or project secretaries at the Division for School Research and Development within the Bureau of Educational Research and Development of the National Board of Education. Their task is to arrange contacts between the research institutions and the officers at the National Board of Education referred to here as liaison officers. The above-mentioned users' representatives, project secretaries and liaison officers are not appointed to control or otherwise interfere with the researchers' liberty to plan their projects in accordance with scientific principles. Rather their function is advisory and is designed to equip the research institutions with practical knowledge and information on the user's problem situation. This network of contacts has the advantage from the point of view of the research institution of ensuring that the direction of their research accords with the practitioners' needs.

Just as researchers can participate in practical educational activities as consultants and experts, practitioners (e.g. teachers) can be associated with the training of researchers and with research at the educational institutions. A special form of this training of researchers, namely experiments with subject-methodological research training in education is dealt with in greater detail in a subsequent section.

Various media-borne forms of information concerning educational research and development have a greater potential range and reach larger target groups, but the network of personal contacts, while limited in its range, has a correspondingly higher quality and effect.

6.1.4 *The organisation basis of information diffusion*

The organisation basis of information is dependent on the nature of its diffusion. Documentation is assigned to special organisations (ERIC), to bibliographical institutes or specialised libraries. Research institutions, research and development centres, regional educational laboratories, etc. are responsible for most of the production of primary information diffusion by means of reports, monographs, articles in journals, etc. Educational suppliers and publishers, the educational and daily press also provide examples of the bases of information diffusion to a wider public.

Research associations in certain countries (e.g. AERA in the USA) play a major part in providing information and discussing policy. A similar function is discharged by State research councils, e.g. the Social Science Research Council in England and Wales, the Scottish Council for Educational Research, the Australian Council for Educational Research and the Canadian Council for Educational Research.

In certain countries research policy and the diffusion of information are profoundly influenced by government bodies or official institutions, such

as the National Foundation for Educational Research (NFER) and the Schools' Council in Great Britain, the emergent National Institute of Education and its predecessor in the USA, the Institut National de Recherche et de Documentation Pédagogiques in Paris, Paedagogisches Zentrum in Berlin and the Bureau of Research and Development of the Swedish National Board of Education in Stockholm.

In so far as the diffusion of information on educational research and development can progress further than the mere collection, processing and diffusion of documents, the nature of the commission together with the element of the development, diffusion and installation of educational innovations will acquire added prominence. It is symptomatic that the extremely comprehensive but diffuse research activities of the USA are now to be more clearly co-ordinated by means of a National Institute of Education (NIE).

Appendix I (Information media and personal contact networks in research commissioned by the Swedish National Board of Education) describes the flow of activities and information in a typical research and development project. The research institution is represented by the principals of the institution, who are scientifically responsible and take charge of the research training included in the project work, and by the project working group consisting of researchers, experts, research assistants, etc. The sponsor, the Swedish National Board of Education, which is the central Swedish school authority, is represented at three levels: the decision level comprising the Director General and departmental heads, the planning level represented by the Educational Research and Development Bureau and including the project secretaries mentioned previously, and the user level comprising officers from various bureaux of the National Board of Education whose planning, teaching and teacher training are directly affected by the results of research and development.

6.2 *Demonstration*

Demonstration in various forms serves to provide users with what is generally efficient, direct information on research and development results. One such form consists of visits to the project or to a school where field experiments are being sponsored by the project. In this way the visitor can obtain on-the-spot information direct from the transmitter which would otherwise require a long drawn out process of written communication.

A word of warning may be appropriate concerning indeterminate study trips and visits to projects generally. Someone requiring no more than a superficial survey of activities can generally obtain relevant and concise written information without paying a personal visit.

On the other hand, the advantage of visits is that they enable the visitor to establish personal contacts which may be a general asset to his future activities.

Demonstrations of this kind are probably most valuable in the case of researchers and development workers visiting colleagues with problems and tasks similar to their own. These visits may take the form of well-planned workshops with an exchange of experience. Visits to research and development

projects can also be arranged in such a way that the visitor participates for a prolonged period as a member of the project staff.

The teacher training organisation of certain countries includes "experimental" or "laboratory" schools. Some of these have been given the form of innovatory centres for experimental and demonstration activities. In 1968 the Swedish schools of education organisation included activities of this kind, certain sections of the municipal school system in areas containing schools of education being used for experiments and demonstrations. The members of the teaching staff at these schools are specially selected for the purpose. Their teaching duties are reduced to enable them to conduct demonstrations. The demonstrations themselves are planned in collaboration with the pedagogics and methodology teachers of the school of education and in close conjunction with development projects at the school of education. These activities are first and foremost a part of teacher training in which the student teachers are enabled among other things to appraise and develop new methods and educational materials and to carry out evaluations of various kinds. This is a new venture which, consequently, has not yet acquired its final form as a pattern of innovation, but it offers numerous opportunities of training in innovation-promoting norms.

Schools of education staffs include a special category of teacher, lecturers in teaching methods, with attested educational skills and knowledge, whose teaching is specially aimed at promoting through prospective teachers the development of educational objectives, methods and evaluation. It is the task of lecturers in methods to keep abreast of practical educational developments in the subjects they teach. These lecturers provide an important link between the theory of education and its practical application.

6.3 *Basic and further training*

The lecturers in methods mentioned above, together with the pedagogics teachers of the schools of education, are able to utilise the results of educational research and development in their everyday teaching. In order to be able to keep abreast of the rapid pace of development, these teachers must to a certain extent specialise in more limited sectors, e.g. objectives, processes, evaluation, systems development, social matters in schools, pupils' difficulties at school, the individualisation of teaching etc. It has been found that stagnation and isolation are liable to occur in teacher training if the individual teacher does not have access to daily communication and contact with his colleagues.

Teacher training should inculcate in the student an attitude of enquiry and critical appraisal towards facts and problems. The old view of teacher training as the acquisition of an arsenal of knowledge and methods for the rest of the student's career is no longer valid. The new teacher must be "information-hungry". But information hunger is not enough. The teacher must be offered in-service training. Summer courses, term-time study days together with study circles and private study parallel to other aspects of his work can give the teacher access to information, communication and personal development. Consequently, it is important for further training courses to be kept up to date, providing information and discussion concerning aspects of development work in which research findings are suitably presented.

Great importance must be attached to the task of converting research and development results into further training programmes for teachers. Teachers in our rapidly changing school system can easily become confused and out of touch unless they are enabled to participate personally in an active interpretation of objectives, the testing of new methods and means and the evaluation of their own and their pupils' work.

Teacher training can assume greater proportions than the above description implies. The Swedish Delta further training project, concerning the introduction in Swedish schools of the new mathematics, is a case in point. The Delta project included study days with pre-tested further training material, private studies in programmed form and auxiliary activities with the aid of special radio broadcasts for teachers. Altogether this project involved two years' part-time further training for the teachers concerned.

Another equally comprehensive programme of further training in Sweden is the JET project (Junior English Teaching), which was offered to and accepted by the majority of those teachers in grades 1-3 of comprehensive school who were not qualified to teach English at the time it became obligatory for pupils at that level. Here, too, study days have alternated with radio broadcasts and private study.

In the course of this further training of teachers it has proved increasingly necessary to involve teachers and researchers who have conducted research and development work with immediate reference to curricular and educational material development.

6.4 *Consultation, "running-in" and evaluation*

It has been observed in the preceding sections that attention should above all be directed towards certain key persons among the users of research and development results. These include further training consultants at central, regional and local level. Sweden has since 1968 been divided into six further training regions, each being centred on a major school of education. Each of these schools of education has its own further training department headed by a director of further training, who is in charge of the organisation of the regional further training programme.

The regional further training programme is predominantly decentralised, being conducted on a county basis (four counties per region) by special further training consultants. An important task in recent years has been gradually to associate these consultants with curricular and educational material development programmes. Each region has a regional committee to plan its activities. The committee is aided in this respect by the educational research institution of the major school of education in the region, which provides services connected with the planning and evaluation of local and regional development programmes.

Certain large-scale research and development projects have their own teaching consultants. This has been the case, for example, in the large-scale IMU mathematics project, where the consultants have assisted in the field phase.

Another personnel category with similar tasks comprises the Swedish inspectors of upper secondary schools, who at the same time as they are concerned with inspection also serve a purpose not dissimilar to that of the further training consultants.

Officers with similar tasks are also engaged on a considerable scale by private educational suppliers. Sometimes they arrange special exhibitions, which in recent years have come to range over an increasingly wider field, not least at international level. One example of information activity of this kind are the DIDACTA exhibitions organised by a European association of educational suppliers.

Similar information is provided in some countries by government and municipal authorities. The 24 government county boards of education in Sweden are each equipped with a regional educational aids centre headed by a superintendent and supplying the municipalities with technical and educational information on new educational materials. Similar centres, though with a more technical slant, known as AV distribution centres, exist in several large municipalities Another increasingly widespread facility at municipal level are the teachers' depots, a kind of shop with basic equipment of various kinds where teachers can develop their own educational material models, either independently or in consultation with technicians. These depots have come to play a particularly important part in the work of remedial teachers of handicapped pupils. Special government, municipal and private development and material centres also exist for the benefit of these pupils.

One could go on to mention more institutions of this kind. Regardless of how they are organised or by whom they are sponsored, it is important for them to maintain continual contact with current research and with the teachers who will be using the finished products.

7. RECOMMENDATIONS

The concluding observations, which also include a comparative section, can be grouped in terms of the components of the documentation and information process:

research and development needs

users (receivers)

researchers and innovators (transmitters)

forms of information diffusion

(a) The need for research and development work felt within research and the educational system justifies the emphasis on commissioning. It is conducted *for* somebody and with a clear objective. In order for information diffusion to match the needs felt, an efficient network of contacts is required including both research and development producers and users.

(b) The users of research and development results are receivers of the documentation and information communicated from research and development.

The requirements made of the receivers can be satisfied more easily by training them or providing them with consultants (*cf.* figure 1). Many of the forms of information considered in the preceding sections of this report are applicable to the training of receivers. This applies to articles in newspapers and journals, books, films, radio and television programmes etc. Conferences and courses provide more pronounced examples of the training of users (information receivers), as do consultation and demonstration.

(c) The requirements made of researchers include the capacity to disseminate research and development results in a form that is accessible to the users. Participation by researchers in state and regional committee work and in the framing of educational policy can help to ensure that information reaches the decision-makers without being misinterpreted or neutralised in the process.

(d) It is impossible to specify in general terms the most efficient forms of documentation and information diffusion for achieving development and innovation in the education sector. A whole complex of activities has to be resorted to. The target groups may be small or large; information must be adapted with regard to its purpose and content and communication may be written or spoken, direct or indirect. A comparative assessment has been attempted in Appendix II, which contains a survey of different means of communication, their purposes and characteristics with reference to section 6. An effort has been made to assess four aspects (information depth, the size of the target group, the efficiency and the importance of the method of communication) by means of a five-point scale, where 1 = very slight information depth, very small target group, very low efficiency and very little importance in the realisation of educational innovations. This attempted grading should be regarded as an illustration, not as an absolute appraisal, the point being that it is up to each individual user to carry out the appraisal best suited to his own needs.

If there is anything in the host of assessments in the table which should be singled out for special attention, it would seem to be the *personal forms of contact*. Again, if there is anything in the wide variety of printed information which can be said to be particularly important today, it is probably the *research surveys* dealing with current research in a broad sector and providing a summary and comparative evaluation of what has already been done, together with an indication of weaknesses, deficiencies and remaining needs.

(e) There are two further aspects which may be particularly important when considering the various forms of documentation and information diffusion in a European perspective. The first of these is the importance of the user becoming more familiar than hitherto with the school systems and educational traditions of other countries, so as to be able to understand more fully the problems dealt with in the educational research of those countries. To this end it is most desirable that a more uniform and stabilised vocabulary be developed in the educational sector to avoid the over-simplification of ostensibly identical terms and concepts (e.g. the German *Lehrplan* resembles but is by no means identical with the English curriculum). The second aspect concerns information in minor or secondary languages. Whatever country or language one is dealing with, there is a risk of important information being lost unless mutual steps are taken to surmount problems of language.

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APPENDIX I

Information media and personal contact networks in research commissioned by the National Swedish Board of Education (vid. text 6.1.4)

Activity	Means of information	Group or level concerned				
		Sponsors (NBE)			Research inst.	
		Policy level	Planning level	User level	Inst. Principals	Project group
Planning stage						
Inventory of research needs	Needs catalogue		x			
Overall planning	Concise plan				x	
Examination	Pronouncement		x	x		
Decision re detailed planning	Minutes (resolution)	x				
Allocation of funds for planning work	Minutes	x				x
Detailed planning	Detailed plan for the duration of the project and schedule of activities for the first year					x
Final decision on the project and allocation of funds for the first project year	Minutes	x	x			
Year 1						
Project work						x
Conference with liaison officers and reference group	Conference		x	x	x	
Interim reporting	Report					x
Summary of project work	Report on activities during year 1					x

Activity	Means of information	Group or level concerned				
		Sponsors (NBE)			Research inst.	
		Policy level	Planning level	User level	Inst. principals	Project group
Planning for year 2	Schedule of activities for year 2					x
Examination of plans	Pronouncement		x	x		
Decision re allocation of funds for year 2	Minutes	x				
Year 2 and subsequent years, if any						
Project work						x
Conference as year 1. Possibly supplemented by a large co-ordination conference with other research institutions	Conference		x		x	
Final year of activities						
Project work						x
Summary of year's work	Report of activities		x	x		
Final printed report	Final report					x
Final account in conference form	Conference		x	x	x	x
Decision re following up project by various means	Minutes	x				

APPENDIX II

Comparison of various modes of communication concerning research and development within the education sector

Mode of communication	Purpose	Information depth	Size of target group	Efficiency as a method of promoting innovation	Importance in the realisation of educational innovation
		1 = very low, 5 = very high			
1. PRINTED INFORMATION					
1.1 Indexes, catalogues	Inform receivers of current activities and new reports	1	4	1	2
1.2 Abstracts	Summarise relevant information for a quick survey	1	4	1	2
1.3 Research surveys, handbooks	To acquaint researchers with the state of research and important problems. For laymen, to summarise relevant information in a readable manner	1	3	2	2
1.4 Articles in journals	Scientific: disseminate selected information to researchers	2	3	2	2
	Popular: supply selected information to wide public	1	5	3	2
1.5 Research reports, monographs	Report theory and methods to other researchers	3	3	1	3
1.6 Popular books and reports	Provide a readable explanation for a wide public	1	2	2	2
1.7 Study kits and teachers' instructions	Innovations in "user form"	4	2	4	4

Mode of communication	Purpose	Information depth	Size of target group	Efficiency as a method of promoting innovation	Importance in the realisation of educational innovation
		1 = very low, 5 = very high			
1.8 Catalogues of research and development needs	Orientation for research producers	1	1	2	3
2. AUDIO-VISUAL AIDS					
2.1 Films	Communicate information or viewpoints in digestible form	2	2	2	1
2.2 Closed circuit TV	Provide concrete information for selected audience	3	1	4	1
2.3 Radio and TV	Provide selected information for wide audience	2	4	1	1
3. NETWORKS OF PERSONAL CONTACTS					
3.1 Letter, telephone, informal discussion	Research leader responsible for reporting the capacity and direction of research production	2	1	3	3
3.2 Contact persons and liaison officers	Supply information to and exchange viewpoints with users of R & D results	3	1	5	5
3.3 Consultants	See 6 below	------- see 6 below --------			
3.4 Symposia and conferences	Supply information to selected target group	4	3	4	4
4. DEMONSTRATION					
4.1 Study visits	Personal visit by user to study the practical feasibility of an innovation	5	1	5	4

Mode of communication	Purpose	Information depth	Size of target group	Efficiency as a method of promoting innovation	Importance in the realisation of educational innovation
		1 = very low, 5 = very high			
4.2 Experimental and demonstration schools	Demonstrate the practical feasibility of an innovation	4	2	4	3
4.3 Demonstrations in teacher training	Demonstrate innovations in their methodological context	4	2	3	3
4.4 Demonstration by educational supplier	Provide information for marketing purposes	3	2	3	3
4.5 Exhibitions	Publicise an innovation e.g. a teaching aid	1	2	1	1
5. BASIC AND FURTHER TRAINING					
5.1 Summer courses	Provide users with selected information	4	1	3	4
5.2 Study days	- ditto -	3	3	3	3
6. GUIDANCE					
6.1 Further training and school consultants	Supply practising teachers with selected information focusing on the practical use of R & D results	3	1	4	5
6.2 Teaching aid consultants	Advise users while "running in" teaching aids or study kits	3	2	4	4
6.3 Research institution vis-à-vis local school system	Support for innovation projects in local or regional school system	4	1	4	5

Mode of communication	Purpose	Information depth	Size of target group	Efficiency as a method of promoting innovation	Importance in the realisation of educational innovation
		1 = very low, 5 = very high			
7. COMPUTERISED INFORMATION SYSTEMS					
	Selective communication of information according to individual needs profile (not yet in regular operation)	-	-	-	-

ABSTRACTING SERVICES IN EDUCATION AND THE SOCIAL SCIENCES

A study of document analysis techniques useful for the development of a computer-based decentralized information network

by

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SUMMARY

Methods of document analysis used by abstracting services in education and the social sciences are examined in the context of the development of a computer-based decentralised educational information network. The content and techniques of presentation of abstracts are described, with particular emphasis given to user "access points" provided to information contained in the abstracts both by conventional indexing or classification techniques and by computerised methods. As a result of this examination, guidelines are suggested for the type and level of document analysis which might be useful for an integrated European Documentation and Information System for Education (EUDISED).

INTRODUCTION

General background

Indexing and abstracting tools serve two main functions: to alert users to the existence of new documents in a particular subject area (current awareness function) and to permit retrospective searches to take place (document retrieval or literature search function). More and more these traditional indexing and abstracting services are being augmented by a third function, that of information analysis, repackaging information contained in many documents into literature surveys or state-of-the-art reports which are aimed at a particular target audience which may be different from the audience reached by the first two types of service.

Very few indexing or abstracting services in the social sciences circulate to as many as 1,000 subscribers world-wide, not even those providing information about a broad range of subjects within particular disciplines or presented in widely used languages such as English or French. Furthermore, most of these services appear to be purchased mainly by libraries and very few by individual research workers, teachers or administrators. In part this can be explained by their cost, but there are a number of other factors inhibiting their use. The most comprehensive services may report on documents many months, or even years after the original documents had been published. There is much duplication of effort and overlap among some services, yet many important primary source documents are not systematically recorded at all. To make matters worse, there is a considerable proliferation of such services (in spite of high operating costs), and many of them are, to say the very least, not very convenient to consult.

Computerised techniques are being increasingly applied to different stages in the operation of information dissemination, storage, processing and retrieval services. As these techniques develop it seems obvious that under certain circumstances research workers and others will themselves wish to interrogate relevant information stores by means of interactive computer systems, and subsequently manipulate the information to serve their own particular needs. This in turn leads one to contemplate on the changing role of librarians and documentalists as "middle men" between information producers and users.

With these different background points in mind, I have attempted to examine a number of the document analysis techniques employed in different indexing and abstracting services, concentrating in particular on "access points" made available to users to locate references of relevance to their work, access points in the form of printed indexes of various sorts, and of those provided by computerised services. After describing a number of these in some detail, I shall attempt to draw together those features of different systems which seem to be the most attractive in the light of what is postulated about the future development of computer-based documentation networks. What I would see as a possible direction in which EUDISED might move is in a multi-level system in which different documentary bits and pieces about a same item could be added as the network's infrastructure develops, and as users react to the various services that the network can offer.

No information system can be all things to all users at all times, yet it should be possible to design a system which would be flexible enough to permit current awareness and retrospective searching to be accomplished from a single data base. That this is not now being done can be illustrated by a rapid look at the literature of economics and of management.

A look at economics literature

The most comprehensive reference tool in the field of economics is the annual *International Bibliography of Economics*, which provides references to some 7,000 to 8,000 documents each year. References are grouped according to a classification scheme printed in each volume. Although each annual compilation also contains an author and subject index, documents are not indexed in depth. At present each annual volume is published approximately 15 months after the end of the calendar year covered by the volume. This means that information about a journal article published in January 1969 was only available in March 1971, 27 months later. It is obvious, therefore, that this bibliography cannot be used as a current awareness tool. Since it does not cumulate, and is not available in machine-readable form, retrospective searches over a large span of time are not easy to undertake. It is not surprising to learn, therefore, that the INFROSS study (1) revealed that only six out of the 348 economists in their sample survey indicated that they used the *International Bibliography of Economics* for their current research.

Only a few more reported using *Economic Abstracts* and none *Documentation Economique*, presumably because of the language barrier. A much higher number, 53 out of 348, reported making use of the *Journal of Economic Literature*, the highest figure of any regularly used by economists. This is interesting for a number of reasons, not the least of which is the fact that this is an American journal, and the surveyed users were in the United Kingdom. A partial explanation may lie in the fact that the journal has, to a certain extent, a captive audience, as it is supplied to all of the some 25,000 members of the American Economic Association, along with the *American Economic Review*. It combines a current awareness function with an information analysis function, each quarterly issue containing a number of literature surveys and review articles. Each issue contains five separate sections containing book reviews, annotated listings of new books arranged in a classified order, listings of contents of current periodicals, a subject index of articles in current periodicals and selected abstracts arranged in

the same classified order used in the section for book annotations. The only index provided to these five sections, however, is an author index, so that one would have to be endowed with considerable patience to attempt to use the journal for retrospective searching. The various entries are not recorded in machine-readable form, so that computer searching is not possible either.

Another investigation, undertaken at Sheffield University (2) related British journals in economics published during 1968 and the first half of 1969 to certain indexing and abstracting services. The author states that "Despite the importance of the literature as a research and development base, bibliographical work within economics is often frustrating and unproductive because of the lack of appropriate or efficient 'tools'. Nowhere are the shortcomings revealed so quickly as in attempts to establish current control of periodical literature published in the United Kingdom.... The consequence of /the/ lack of a specialised agency, or group of agencies, exercising what amounts to national control is a disturbing bibliographical ineffectiveness. British economists' writing does not flow into the appropriate bibliographical channels that lead to libraries, information centres and research workers at national, inter-national and supra-national levels."

A look at management literature

One of the most thorough investigations in recent years into indexing and abstracting services in the social sciences was undertaken in 1968 by Dews and Ford (3). As many of the indexing and abstracting services relevant to this present paper have already been described in this investigation, I am setting out in the following paragraphs some of their main findings, and will then turn to a detailed description of a few key services covering educational documentation.

Dews and Ford examined 51 abstract journals, indexes and other similar guides to current literature in the field of business studies. This was done in two stages:

1) A detailed examination of the individual services as to frequency, cumulations, adequacy of indexes, time lag, scope of subject and type of material covered; and

2) An assessment of the present coverage of relevant periodicals by these various services.

Of the 51 services, 10 were themselves indexes, only 31 of the others had subject or author indexes to the main sequence, so that only these could be used for retrospective searching. Of these 31, some had subject indexes with each issue cumulating annually (one case was found of a further cumulation over five-year-periods - *Psychological Abstracts* - and one decennial index - *Sociological Abstracts*). Some had annual subject indexes only, and 10 were issued on cards or in loose-leaf form so that they could be constantly interfiled into a classified order.

The document references were presented in the main sequence of the indexing and abstracting services in a variety of ways, although 25 of the 51 opted for some sort of arrangement by subject expressed in natural language.

Only two were in a widely-used classified order (UDC), 12 others used their own unique classification schemes and four were in no order at all.

Forty-seven of the services were entirely in English, two entirely in French and the remaining two, both published in the Netherlands, were multilingual. Dews and Ford state that of the 32 services which were in the form of abstracts, 14 were indicative (giving a brief description of the contents), 10 were informative (containing most of the original argument and data) and 12 were semi-informative.

An attempt was then made to see how well the journal literature in the field of management was related to the different abstracting and indexing services. Of the 2,366 management journals which were identified by the authors, only 1,110 (47%) were covered by one or another of the 51 services. Discounting journals not suited for indexing, there were still some scholarly journals not covered at all, and others, on the contrary, which were covered by a great many services. Twelve journals were scanned by no fewer than ten services, and one (the *Harvard Business Review)* by 23!

Sectors having the poorest coverage in the indexing and abstracting services were Economics, Transport, Education and the Enterprise. Psychology had by far the best coverage, which can be easily explained by the sole presence of *Psychological Abstracts*. It appeared that the real difficulty in retrieving information lay not so much in non-coverage as in the scattering of coverage. It was unlikely that any library could stock all of the services necessary to obtain maximum coverage, and of course many of these services were not organised in such a manner as to facilitate retrospective searching.

Another problem which limited the usefulness of many in the current awareness function was the time lag between the date of primary and secondary publication. It was found that approximately 60% of the services had a mean time lag of six months or less. A notable exception was *Sociological Abstracts* with an average mean time lag of 19·6 months. The table below indicates the mean average time lag for several of the services mentioned earlier in this paper as well as for some of those to be examined in the following pages.

Economic Abstracts	- 3·5 months
Technical Education Abstracts	- 4·8 months
CIRF Abstracts	- 4·9 months
Psychological Abstracts	- 5·6 months
Journal of Economic Literature	- 5·8 months
Research into Higher Education Abstracts	- 6·0 months
Department of Employment Training Abstracts Service	- 8·0 months
Documentation économique	- 12·8 months
Government Reports Announcements	- 13·4 months
Sociological Abstracts	- 19·6 months

(NB The 1971 titles of these services have been given in this table.)

Among the conclusions emerging from this study, a number are worth mentioning with respect to the present exercise:

1) There was no single service providing adequate subject coverage for management literature;

2) Certain types of material were difficult to trace, particularly statistics and ephemeral news items;

3) The time interval between primary and secondary publication was often longer than the tolerable average of up to six months;

4) There were too many services to search for material;

5) The diversified methods of arrangement within the services created difficulties whilst searching;

6) Many services were badly indexed and impossible to use for retrospective searching, thus only realising half their potential value;

7) If a new service were to be started, consideration should be given to the use of computer techniques.

EXAMINATION OF INDEXING/ABSTRACTING SERVICES IN EDUCATION

Methodology

In an attempt to compare the document analysis and indexing techniques used by various services in the field of education, I decided to search these for a sample of 88 educational research documents published in 1969 and 1970 which had been retrieved from the ILO's ISIS system by a computer search. It was found necessary to restrict the investigation to English language documents only, as it proved almost impossible to locate any of the references written in languages other than English. To be sure, a number of non-English language items were found in *CIRF Abstracts*, but to have included these would have been tantamount to incest, as references to all documents abstracted by CIRF had automatically been included in the ISIS system anyway, by special agreement.

Then it was necessary to further restrict the exercise by excluding both indexing services where documents were posted under only one or two subject headings, and abstracting services which neither provided subject groupings for the abstracts nor any subject indexes which would permit retrospective searching.

The examination of the remaining services which are described here led to a number of unexpected results. Only one document in the sample group of 88 was found in four different services. This was a British document, the only British abstract of which turned out to be a reprint of an abstract appearing in an American journal, which had in turn been copied, except for the last sentence, from *Research in Education*. There seemed to be a special jinx on one service, *Technical Education Abstracts*, as of the two items found,

one abstract was completely false, presumably due to the printer's error, and in the other both the author and the title of the document had been incorrectly recorded. Another curious finding was that British journal articles quite often were reported in the American *Current Index to Journals in Education* before they appeared in British services, and conversely American documents occasionally were recorded faster in British services or in the Geneva-based ILO service than in the ERIC tools. Not a single one of the 88 documents in the sample had yet been treated in *Sociological Abstracts*, and only one in *Psychological Abstracts*, but it only referred to a listing of the item in *Dissertation Abstracts*. It should be noted in passing that at the time of writing this paper (end June 1971) no 1971 issues of either *Psychological Abstracts* or *Sociological Abstracts* had been received yet in Geneva.

Current Index to Journals in Education (CIJE)

CCM Information Corporation, 866 Third Ave., New York 10022.
v.1- ; 1969- . Monthly, with semi-annual and annual cumulations. $ 39.00 (monthly only), $ 29.50 (annual only), $74.00 (monthly, semi-annual and annual).
Circulation - 2,000 (foreign subscribers - 262)

Also available on 9-track magnetic tape (1600 or 800 BPI) in the form of IBM 360 Operating System variable length records from ERICTAPES, Leasco Systems and Research Corporation, 4833 Rugby Ave., Bethesda, Maryland 20014. The entire file is contained on one tape reel, costing $ 80.00, or $ 50.00 when copied on an unused tape supplied by the customer. Quarterly updates are available under the same conditions. The average record length of each entry is 400 characters.

Input to *CIJE* is prepared on a decentralised basis by the 20 subject focussed clearinghouses of ERIC (the Educational Resources Information Center of the US Office of Education). In addition a number of journals are indexed centrally by the Leasco facility in Bethesda; in the March 1971 issue these represented 43% of the total. A list of the 530 journals which are scanned is published in each monthly issue. Those journals asterisked (*) are indexed cover-to-cover. At the present writing (June 1971) some 35,000 references to journal articles are on file, incrementing by approximately 1,000 new entries per month.

Each journal article is characterised by a number of subject descriptors, chosen from the *Thesaurus of ERIC Descriptors* (4). A maximum of five major descriptors may be starred by the indexer (*) and these, and only these, are used to generate an entry in the printed subject index, although all descriptors are available for retrieval from the machine-readable file. Identifiers, or additional indexing terms - such as names of agencies or companies, or place names - are indicated in brackets. These terms are not taken from the *Thesaurus*, but if asterisked they will print out as well in the subject index.

When it is felt that the title of the journal article does not clearly indicate the subject matter dealt with therein, a short 30-50 word annotation may be written. The ERIC Clearinghouses seem to write these annotations more frequently, however, than the central Leasco facility.

Example 1

EJ 023 859 040 RC 500 263
The Natives are Restless: The Ethos and Mythos of Student Power Jameson, John; Hessler, Richard M., *Hum Organ*, v29 n2, pp81-94, Sum '70
*Activism, *Behavioral Science Research, *Conflict, *Student Attitudes, *Student College Relationship, College Student, Negro Students, Political Attitudes, Racial Attitudes. /Pittsburgh, University of/

Example 2

EJ 021 443 220 AC 500 640
Decision Making in Training Garbutt, Douglas, *Ind Training Int*, v5 n5, pp 213-214, May '70
*Financial Policy, *Industrial Training, *Grants, Decision Making, /*Great Britain. Industrial Training Act of 1964/
The author examines various aspects of training officer's receptivity to the levy-grant system of financing industrial training, as provided under the Industrial Training Boards in Great Britain. (MF)

Each article is given a sequential EJ entry number. Entries are arranged in each issue by descriptor group codes (Example 1: Group 040=Attitudes; Example 2: Group 220=Finance). These descriptor groups are taken from the *Thesaurus*. Clearinghouse accession numbers are also recorded for each entry. The list of the 19 Clearinghouses with their corresponding two-letter codes is given in the description of *Research in Education*.

A subject index is included in each issue. Any asterisked descriptor or identifier generates an index entry, such as:

Video Tape Recordings
Portable Video Recording in Higher Education. *Audiovisual instruction* v15 n10, pp46-8, Dec '70 EJ 030 896

The Author index contains personal author entries, each with the title of the article and the relevant EJ entry number. And finally, a journal contents index is also included in each issue which lists under each journal title those articles indexed in that particular issue of *CIJE* with their relevant EJ entry numbers.

CIJE is compiled by means of computer manipulation of the main entry data (see examples 1-2). Typesetting is accomplished by photocomposition. The typography is excellent, and the index is extremely well presented, and except for the subject index, quite easy to consult. It does not really seem feasible to conduct a retrospective search in *CIJE* without referring to the *Thesaurus*. A lengthy book review of *CIJE*, which is rather critical of the use (or misuse?) of descriptors and identifiers, appears in the March-April 1971 issue of *JASIS* (5). Harvey Marron, of ERIC, answers these criticisms in the subsequent issue, May-June 1971.

Research in Education (RIE)

Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. v.1- ; 1966- . Monthly, with semi-annual and annual cumulative indexes. Longer cumulations available from commercial publishers.[1] $ 21.00 (monthly) domestic, $ 26.25 foreign. Price of annual indexes varies from $ 3.25 to $ 8.25.

Circulation - 5,200, including 1,100 free distribution and 262 foreign subscriptions. Subscribers include institutions of higher education (35%), state and local educational agencies (32%), foreign institutions (6%), other domestic (27%).

Also available on 9-track magnetic tape (1600 or 800 BPI) in the form of IBM 360 Operating System variable length records from ERICTAPES, Leasco Systems and Research Corporation, 4833 Rugby Ave., Bethesda, Maryland 20014. The entire file is contained on 2 tape reels (1600 BPI) or 3 reels (800 BPI), costing $ 80.00 per reel, or $ 50.00 when copied on an unused tape supplied by the customer. Quarterly updates are also available at $ 80.00 or $ 50.00 per reel. The average record length of each entry is 1,800 characters.
CIRCULATION - 100, including 6 foreign subscribers.

Input to *RIE* is prepared on a decentralised basis by the 19 subject focussed clearinghouses of ERIC (the Educational Resources Information Center of the US Office of Education). In addition a number of research reports are abstracted and indexed centrally by the Leasco facility in Bethesda; in the

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[1] There appear to be two of these, which were not available for examination at the time of writing this paper. They are:

(a) *The ERIC Educational Documents Index, 1966-1969.* New York, CCM Information Corp., 1970. 2 v. Cumulative subject and author index, in which each subject and author entry is followed by the complete title and ED accession number. $ 34.50

(b) *Complete Guide and Index to ERIC Reports thru December 1969.* Englewood Cliffs, Prentice-Hall, 1970. 1 v. $ 35.00

April 1971 issue these represented 1% of the total. Some 50,000 research reports are issued yearly as conference papers, reports from colleges and universities and by the various state and local educational authorities in the United States. Approximately 10,000 of these are selected for inclusion in *RIE* on the basis of quality, significance and originality, and their references together with relevant indexes and abstracts are published monthly. At the present writing (June 1971) some 48,000 abstracts are on file, incrementing by approximately 1,000 new entries per month.

Each document is characterised by a number of subject descriptors, chosen from the *Thesaurus of ERIC Descriptors* (4). Descriptors are listed in alphabetical order following each bibliographical citation. On an average, 10·5 descriptor postings have been made per document. A maximum of five descriptors considered as the major subjects of the report may be starred by the indexer (*) and these, and only these, are used to generate an entry in the printed subject index, although all descriptors are available for retrieval from the machine-readable file. Identifiers, or additional indexing terms - such as names of agencies or companies, or place names - are indicated in brackets. These terms are not taken from the *Thesaurus*, but if asterisked they will print out as well in the subject index, eg *Piaget (from the April 1971 issue).

In addition to choosing the appropriate descriptors which are used as index entries, the 19 clearinghouses prepare informative abstracts of about 200 words in length. On occasions edited author abstracts are used instead of "original" ones. Each abstract is given a sequential ED entry number. Entries are arranged in each issue alphabetically by clearinghouse prefix initials. Because of the special orientation of each clearinghouse, this corresponds, in effect, to a rough subject grouping, as can be seen from the list of the 19 clearinghouses:

ADULT EDUCATION
Syracuse University
Syracuse, New York 13210

COUNSELING AND PERSONNEL SERVICES
University of Michigan
Ann Arbor, Michigan 48104

DISADVANTAGED
Teachers College
Columbia University
New York, N.Y. 10027

EARLY CHILDHOOD EDUCATI
University of Illinois
Urbana, Illinois 61801

EDUCATIONAL MANAGEMENT
University of Oregon
Eugene, Oregon 97403

EDUCATIONAL MEDIA AND TECHNOLOGY
Stanford University
Stanford, California 94305

EXCEPTIONAL CHILDREN
The Council for Exceptional Children
Arlington, Virginia 22202

HIGHER EDUCATION
George Washington University
Washington, D.C. 20006

JUNIOR COLLEGES
University of California at Los Angeles
Los Angeles, California 90024

LANGUAGES AND LINGUISTICS
Modern Language Association of America
New York, N.Y. 10011

LIBRARY AND INFORMATION SCIENCES
American Society for Information Science
Washington, D.C. 20036

READING
Indiana University
Bloomington, Indiana 47401

RURAL EDUCATION AND SMALL SCHOOLS
New Mexico State University
Las Cruces, New Mexico 88001

SCIENCE, MATHEMATICS, AND ENVIRONMENTAL EDUCATION
Ohio State University
Columbus, Ohio 43221

SOCIAL STUDIES/SOCIAL SCIENCE EDUCATION
University of Colorado
Boulder, Colorado 80302

TEACHER EDUCATION
American Association of Colleges for Teacher Education
Washington, D.C. 20005

TEACHING OF ENGLISH
National Council of Teachers of English
Urbana, Illinois 61820

TESTS, MEASUREMENT, AND EVALUATION
Educational Testing Service
Princeton, New Jersey 08540

VOCATIONAL AND TECHNICAL EDUCATION
Ohio State University
Columbus, Ohio 43212

A subject index is included in each issue. Any asterisked descriptor or identifier generates an index entry, which displays the document title and the relevant ED number.

Program Planning
The Difference between Conventional Budgeting and PPB.
ED 045 115
Educational Research and Development: Implications for Research Management from a National Perspective.
ED 045 008
Goals and Objectives in PPBS.
ED 044 815

Searching the subject index poses something of a problem, however, as there are no cross-references, so that a copy of the *Thesaurus* should be near at hand. Users interested in PPBS, for example, should be warned not to look just under the heading above, where 10 documents are listed in the April 1971 issue, but also under:

Planning Programming Budgeting System (PPBS)

where 15 documents are listed. Three documents, incidentally, appear under both headings.

The author index contains personal author entries, each with the title of the document and its relevant ED entry number. And finally, each issue contains an institution index (corporate author index), which lists titles of documents under the name of the institution responsible for them. A cross reference index relating ERIC clearinghouse numbers and ERIC document numbers (ED) is also provided.

RIE is compiled by means of computer manipulation of the main entry data (see examples 3-4), resulting in a tape used in Linotron printing. The typography is excellent, and the indexes are extremely well laid out, and with the exception of the subject index (for non-typographical reasons!) quite easy to consult.

Microfiche copies of most of the research reports abstracted in *RIE* are available either on a subscription basis or on individual request from the ERIC Document Reproduction Service, operated by Leasco Information Products, Inc., Post Office Drawer O, Bethesda, Maryland 20014. There are 425 organisations maintaining complete ERIC microfiche collections, including 23 outside the United States (16 in Canada, one each in Australia, Denmark, France, the Federal Republic of Germany, Sweden and the United Kingdom, and one in the International Bureau of Education, Geneva, the latter beginning in 1971). Of these, university or college libraries comprise 73%, state or local educational institutions 21%, all other users 6%. Well over 6,000,000 copies of ERIC reports (both hard copy and microfiche) were sold during 1970, the vast majority to global subscribers. Some 50,000 individual hard copy orders were filled and 70,000 microfiche orders. Individual orders for microfiches cost $ 0.65 per *document*, and subscription orders cost $ 0.089 per *fiche*.

Example 3
(abstract total 23 lines)

ED 041 141 VT 011 361
Finch, Curtis R And Others
Instructional Resources for Vocational-Technical Education: Teacher Attitude, Resource Availability, and Resource Utilization.
Pennsylvania State Univ., University Park Dept of Vocational Education
Spons Agency—Pennsylvania State Dept of Public Instruction, Harrisburg Bureau of Vocational, Technical, and Continuing Education
Pub Date Feb 70
Note—59p
EDRS Price MF-$0.50 HC-$3.05
Descriptors—*Resource Materials, *Teacher Attitudes, *Technical Education, *Use Studies, *Vocational Education
Semantic differential scales were used to collect data from 100 high school teachers representing eight area vocational-technical schools in Central Penn[illegible] revealed that determine[illegible] instructional resources in accordance with their personal involvement with resource preparation, selection, presentation, and application. The results indicate that preservice and inservice experience should be provided to acquaint teachers with new resources (SB)

Example 4
(abstract total 27 lines)

ED 036 624 VT 009 978
Rulstrom Stig Emil
Beliefs of Industrial Education Teachers Regarding Their Teaching Practices for Preventing Dropouts.
Spons Agency—Office of Manpower Policy, Evaluation and Research (DOL), Washington, D C
Pub Date 69
Note—686p
Available from—University Microfilms Inc., 300 North Zeeb Road Ann Arbor Michigan 48106
Document Not Available from EDRS
Descriptors—Bibliographies, Doctoral Theses, Dropout Prevention, Dropout Research *Dropouts, *Industrial Arts Teachers, Industrial Education Inner City *Teacher Attitudes, Teacher Rating, *Teaching Methods Urban Schools
Identifiers—Office Of Manpower Policy Evaluation Research, *OMPER
The purpose of this study was to identify, evaluate, and study in depth selected beliefs regarding teaching practices that could help [illegible] education teachers [illegible] inner city [illegible] demonstrated school-team holding power (5) implementation measures for these practices and (6) factors which make these teaching practices difficult to fulfill. This Ed D thesis was submitted to Wayne State University (GR)

Other ERIC services

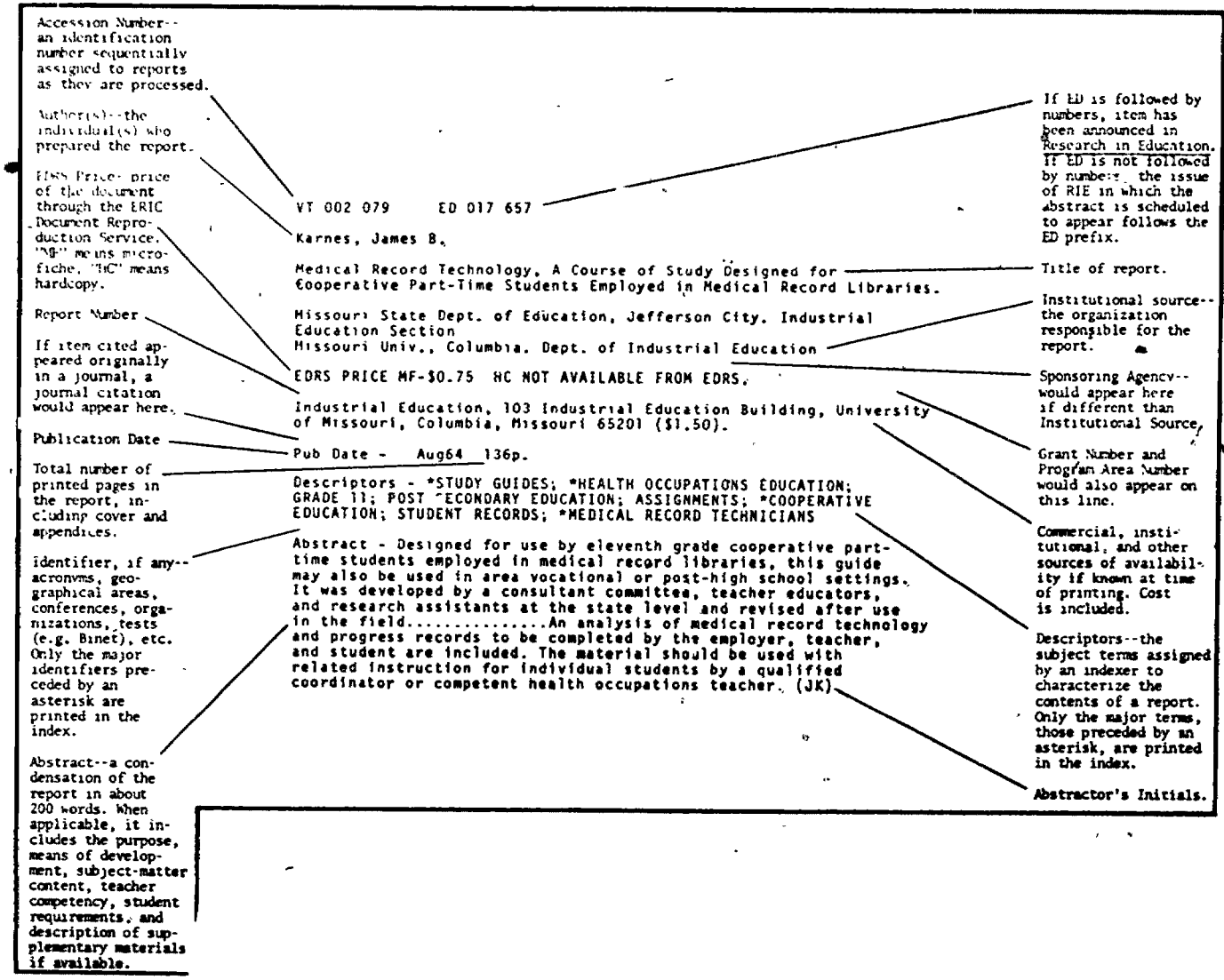
Some of the individual ERIC subject clearinghouses also publish different types of bibliographical tools. An example of these is VT, the ERIC Clearinghouse on Vocational and Technical Education located at Ohio State University in Columbus, which publishes two quarterly abstract bulletins:

(a) *Abstracts of Instructional Materials in Vocational and Technical Education* (AIM); and

(b) *Abstracts of Research and Related Materials in Vocational and Technical Education* (ARM).

The basic principles used in compiling these abstract journals are quite similar to those employed by the central ERIC facility, but they are interesting for a number of other reasons, aside from the specialised subject orientation. Any form of document is dealt with in these quarterly bulletins, whereas *CIJE* and *RIE* are restricted to two types of documents only, respectively journal articles and research reports. They also include a great number of documents which are several years old, which would indicate that a careful selection of materials still thought to be valid is being made. The bulletins are directly reproduced from computer printout (upper and lower case), rather than by computer-controlled photocomposition.

A sample entry for a VT abstract is given on the next page. More complete information about other ERIC activities is given in a recent article by Lee Burchinal (6).


Accession Number--an identification number sequentially assigned to reports as they are processed.
Author(s)--the individual(s) who prepared the report.
EDRS Price--price of the document through the ERIC Document Reproduction Service. "MF" means microfiche. "HC" means hardcopy.
Report Number
If item cited appeared originally in a journal, a journal citation would appear here.
Publication Date
Total number of printed pages in the report, including cover and appendices.
Identifier, if any--acronyms, geographical areas, conferences, organizations, tests (e.g. Binet), etc. Only the major identifiers preceded by an asterisk are printed in the index.
Abstract--a condensation of the report in about 200 words. When applicable, it includes the purpose, means of development, subject-matter content, teacher competency, student requirements, and description of supplementary materials if available.
VT 002 079 ED 017 657
Karnes, James B.
Medical Record Technology, A Course of Study Designed for Cooperative Part-Time Students Employed in Medical Record Libraries.
Missouri State Dept. of Education, Jefferson City. Industrial Education Section
Missouri Univ., Columbia. Dept. of Industrial Education
EDRS PRICE MF-$0.75 HC NOT AVAILABLE FROM EDRS.
Industrial Education, 103 Industrial Education Building, University of Missouri, Columbia, Missouri 65201 ($1.50).
Pub Date - Aug64 136p.
Descriptors - *STUDY GUIDES; *HEALTH OCCUPATIONS EDUCATION; GRADE 11; POST SECONDARY EDUCATION; ASSIGNMENTS; *COOPERATIVE EDUCATION; STUDENT RECORDS; *MEDICAL RECORD TECHNICIANS
Abstract - Designed for use by eleventh grade cooperative part-time students employed in medical record libraries, this guide may also be used in area vocational or post-high school settings. It was developed by a consultant committee, teacher educators, and research assistants at the state level and revised after use in the field.....An analysis of medical record technology and progress records to be completed by the employer, teacher, and student are included. The material should be used with related instruction for individual students by a qualified coordinator or competent health occupations teacher. (JK)
If ED is followed by numbers, item has been announced in Research in Education. If ED is not followed by numbers, the issue of RIE in which the abstract is scheduled to appear follows the ED prefix.
Title of report.
Institutional source--the organization responsible for the report.
Sponsoring Agency--would appear here if different than Institutional Source.
Grant Number and Program Area Number would also appear on this line.
Commercial, institutional, and other sources of availability if known at time of printing. Cost is included.
Descriptors--the subject terms assigned by an indexer to characterize the contents of a report. Only the major terms, those preceded by an asterisk, are printed in the index.
Abstractor's Initials.

Example 5

Government Reports Announcements (GRA) and *Government Reports Index (GRI)*

National Technical Information Service, Springfield, Virginia 22151. v.1- ; 1965- . Changed title several times, being called *GRA* and *GRI* since 10 April 1971. $ 30.00 (GRA), semi-monthly; $ 22.00 (GRI), semi-monthly with quarterly and annual indexes available separately.

Also available on magnetic tape (semi-monthly) for $ 1,500.00 per year.

This abstract journal is one among several examples of very large-scale operations in the broad field of science and technology, and is cited mainly because it provides another illustration of the approach taken by ERIC in the treatment of documents. The two examples reproduced (examples 6 and 7) show the similarity between the two systems. *GRA* publishes abstracts of approximately 50,000 new government-sponsored reports and translations of non-English language documents each year. The journal is presented in the form of 22 subject fields. Field 5 (Behavioral and Social Sciences) contains a subject group entitled Personnel Selection, Training and Evaluation (5I), and the two examples reproduced below are taken from this section.

Example 6
(abstract total 16 lines)

AD-718 309 PCS3 00 MFS0 95
Naval Postgraduate School Monterey Calif
RASCAL: A RUDIMENTARY ADAPTIVE SYSTEM FOR COMPUTER-AIDED LEARNING.
Master's thesis.
John Christopher Stewart Dec 70, 152p

Descriptors (*Programmed instruction, Adaptive systems), Teaching machines, Computer programs, Teaching methods, Theses
Identifiers RASCAL (Rudimentary Adaptive System for Computer Aided Learning), Rudimentary adaptive system for computer aided learning, *Computer aided learning, *Computer aided instruction, PL/1 programming language

The requirements of a Computer Aided Learning System which would be a reasonable assistant to the teacher are discussed. These ideas are implemented in a system [illegible] are generated as a [illegible] the system's interaction with a student, as is the selection of the branch to follow in aiding the student. The results obtained to date, while not extensive in their scope, indicate that a system such as RASCAL can be useful in the classroom. (Author)

Example 7
(abstract total 22 lines)

PB-197 260 PCS3 00 MFS0.95
[illegible] Systems Inc., Vienna, Va
ANALYSIS OF WIN PROGRAM AUTOMATED TERMINATION DATA. PHASE I.

9 Nov 70 146p* MTL 71 01
Contract DOL-53-49-70 02

Descriptors (*Industrial training, Effectiveness), (*Manpower utilization, Statistical data) Employment, Management, Performance, Surveys, Classifications, Placement, Automatic control, Background
Identifiers WIN program, *Work incentive programs, Dropouts, Biographic characteristics, Management information systems

The report contains an analysis of the WIN Program termination data collected and maintained by the Department of Labor. The [illegible] base of WIN terminees [illegible] of the termination diploma is a key factor [illegible] successful placement of WIN participants, but education otherwise appears to have no impact on success. The WIN Program is most effective in placing older males with large families, least successful with both males and females of the 21 and under age group. (DLMA abstract)

It should be noted that practically all of the abstracts are written by the authors themselves. The descriptors are assigned by the NTIS (formerly known as the Clearinghouse for Federal Scientific and Technical Information)

Individual microfiche copies of most of the documents abstracted can be purchased from NTIS for $ 0.95 each. In addition, it is possible to subscribe to their Selective Dissemination of Microfiche service, and receive twice monthly all new documents on microfiche within selected fields of interest. Under the selective dissemination scheme, individual titles cost $ 0.35 each.

Poverty and Human Resources Abstracts (PHRA)

Sage Publications, Inc., 275 South Beverly Drive, Beverly Hills, Calif. 90212. v.1- ; 1966- . Quarterly. $ 40.00 (institutions), $ 10.00 (individuals), $ 8.50 (students).

Circulation - 1,284

Surely one of the most attractively presented abstract journals published anywhere, *PHRA* contains approximately 250 highly informative abstracts in each issue arranged into the following groups and sub-groups:

Characteristics and conditions
- Disadvantaged groups
- Labour force

Approaches and remedies
- Social policy and action
- Community development and involvement
- Income support
- Manpower support
- Job development and training
- Legal rights and assistance

Example 8
(abstract total 18 lines)

0595

Davis, Earl E., A STUDY OF LOW-WAGE WORKERS AND THEIR RESPONSE TO HIGH INTENSITY TRAINING, Vol. 1 Final Report, Skill Advancement, Inc., 633 Fifth Avenue, New York, N.Y. 10022, July 10, 1969, 243 pages.

LOW-INCOME WORKERS. TRAINING.

Skill Advancement, Inc. (SAI) was formed in 1966 to research, develop, and implement a program to upgrade unskilled workers through training in cooperation with trainees' employers and unions. This report presents [illegible] complete low-skilled workers within [illegible] was then made. The effects of [illegible] on the subjects could not be adequately studied because of incomplete data. However, with regard to predicting trainee success in the program, some statistically significant trends were found which indicate that more research attention should be paid to supervisory personnel as determinants of a subject's success in a training program.

Each abstract is accompanied by a number of index terms which are used as entries in the combined author-subject index in each issue. The abstracts contained in the last few issues of *PHRA* were all written by Gordon Barhydt, co-author of the *Information Retrieval Thesaurus of Education Terms*.

PHRA changed publisher at the beginning of 1971, and no issues prepared by the new company are yet available for perusal. It is to be hoped that they are able to maintain both the high level of excellence in the abstracts as well as the remarkable quality of graphic presentation of the journal itself.

Technical Education Abstracts from British Sources (TEA)

Information for Education Ltd., School of Education,
19-23 Abercromby Square, Liverpool 7, L69 3BX. v.1- ;
1960- . Quarterly. £ 5.45.

Circulation - 500

Each issue contains 120 informative abstracts arranged according to an adaptation of the Universal Decimal Classification. A list of major journals scanned appears in each issue, as well as author and subject indexes, the latter cumulating yearly (unfortunately in the April-June issue, which is not where one is likely to look for an annual index).

Example 9
(abstract total 35 lines)

375 *Industrial training*

OATLEY, MICHAEL. **The economics of training.** British Journal of Industrial Relations, vol. 8, no 1, 1970, pp. 1-21.

Training is viewed as an investement in human capital which can be subjected to the same positive decision criteria as an investment in physical capital. Th... sider: the alternative ... five ... ey tend to view training more as an expense than an investment, and to take a limited view of training rather than to see it as skills acquisition. These 'potential deficiencies' warrant investigation of the Board's practices, interpreted in the light of economic studies of training programmes

Unlike the previous 8 examples, there is no indication given with *TEA* abstract entries of descriptors or index terms used to identify the document, so it was necessary to do a sequential scan of the entire subject index to locate the sole posting for this document (Industrial Training - Cost effectiveness).

There appears to be no form of vocabulary control exercised in the choice of index terms, as the following separate entry terms from the 1969/70 annual index illustrate:

Management - Education and Training

Management Development

Management Education

Management Training

In passing, it should be noted that in Example 9, both the author's name and the title of the article have been incorrectly transcribed in *TEA*.

Training Abstracts Service (TAS)

Department of Employment, Training Department (TD4), 168 Regent St., London, W.1. 1968- . Monthly card service. £ 5.50.

Circulation - ?

TAS brings together abstracts of training documents appearing in a wide range of journals and abstracting services published in different countries. No attempt is made to edit these, but when summaries of significant papers do not exist, informative abstracts of up to 400 words in length are prepared by the *TAS* staff.

To date 3,200 abstracts have been issued on 6" x 4" cards. Approximately 80 new abstracts are distributed in each new monthly batch. One or more classification codes are given on each card. These codes are taken from a special classification system designed by the Training Department. Users are supplied with a handbook which explains the operation

Example 10
(abstract total 37 lines)

3133	Apr. 1971			260/645/732/733

THE ROLE OF EDUCATION IN VOCATIONAL TRAINING

VAN STRAUBENZEE, W. R.
BACIE Journal, Dec. 1970. pp.128-134.

Technical colleges were deeply involved in vocational education long before the Industrial Training Act. Since 1963 close links have been established between boards and the Further Education service. But some doubt... its value to industry and commerce.

The author sees the ... people by way of day (or ...) ... discussed in detail. Sections follow on the ...management education and computer training, and the rise in demand for full-time integrated courses combining further education and training. There are today over a million day students in further education, three quarters of whom are in employment and following courses through day or block release. Both further education and industrial training are concerned essentially with developing people; they complement one another and are generally inextricably

(1004)3133.1 DEPARTMENT OF EMPLOYMENT TRAINING ABSTRACTS SERVICE /Contd.

and the scope of the service and sets out in detail the specialised classification system.

There are no indexes of any kind, other than a quarterly listing of secondary code numbers. In General, card and loose-leaf services are a bane to libraries and documentation services unless sufficient manpower is available to do the necessary interfiling. They may, however, be most useful to the individual research worker who can keep his own personal file of only those cards of relevant interest. In the present case, the abstracts are very good, but the lack of a key on each card to permit to "decode" the subject numbers, coupled with the lack of any kind of index, certainly detracts from their usefulness. I would imagine that one would have to be highly motivated indeed to file the cards regularly, let alone try to use them for any kind of subject search.

(It was announced in summer 1971 that the Training Abstracts Service would be discontinued.)

Sociology of Education Abstracts (SEA).

Information for Education Ltd., School of Education,
19-23 Abercromby Square, Liverpool 7, L69 3BX. v.1- ;
1965- . 6 times a year. £ 5.00.

Circulation - 830

Input to *SEA* is international in coverage, and abstracts are prepared on a decentralised basis by a large team of abstractors who are also users of the service. Approximately 1,100 abstracts are published each year. It was conceived of primarily as a current awareness medium for the dissemination of knowledge about sociological research into education, with the object of improving the quality of such research. Designed by academics for the use of academics, it was felt that time spent working over the literature, or on abstracts of it, is not necessarily time wasted, as this activity may be part of the intellectual process.

Each abstract is accompanied by a number of three-digit study area codes, the keys to which are found in indexes included in each issue. Abstracts are arranged in alphabetical order by author. The documents are not indexed in depth, as it was not originally intended to use *SEA* for detailed retrospective subject searches. However, in order to enable *SEA* to develop an information retrieval system adapted to users' requirements, an OSTI[1] grant was awarded, and a number of studies undertaken /Swift (7)/. The SEA-OSTI project is seen as a case study in the problems of information processing in the social sciences, and is being used, for example, to test the applicability to abstracts of the PRECIS indexing system, described in a later section of this paper. An account of the progress of the project by V.A. Winn (8) has recently been published.

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[1] OSTI is the Office for Scientific and Technical Information of the UK Department of Education and Science.

Example 11
(abstract total 20 lines)

858 **Blaug, Mark [London U], Layard, Richard [London School of Economics] and Woodhall, Maureen [London U]** THE CAUSES OF GRADUATE UNEMPLOYMENT IN INDIA. London, Allen Lane, Penguin Press, 1969, 312pp. 105/-. (LSE Studies on Education)

The study is part of a joint project on manpower and educational planning in India undertaken by the Higher Education Research Unit at the LSE and the New Delhi Planning Unit of the Indian Statistical Institute. The authors define [illegible] ment as the unemployment of all [illegible] schooling [illegible] granted and proceed to chapter 10) about the extent of [illegible] unemployment, the public and private labour market, the brain drain, the effect of education on income, and the costs of and the rates of return on education. The final chapter deals with diagnosis and cure, the diagnosis that Indian higher education is badly overexpanded from the social point of view and the cure that education authorities should seek to reduce the growth of secondary and tertiary education. PC 303 311 604 606 - S22

The codes at the end of this abstract refer to the following categories in the subject index:

303 - Occupational choice - Manpower supply and demand
311 - Education and the economy
604 - Employment practices and working conditions
606 - Professional training and qualifications
S22 - Basic social institutions: Economic

Sociological Abstracts (SA)

Sociological Abstracts Inc., 73 Eighth Ave., Brooklyn, N.Y. 11215.
v.1- ; 1953- . 6 times a year plus cumulative index, $ 100.00.

Circulation - 2,000

Input to *SA* is quite international in nature, unlike most of the other services described so far in this paper. During 1970, 6,516 informative abstracts were published. In some cases these are author or modified author abstracts, in other cases they are signed abstracts prepared by the *SA* staff and a rather large number are homotopic or modified homotopic abstracts, abbreviated HA (whatever they might be...). The abstracts are in general very informative, although full of abbreviations, such as:

Sch-aged pop, Ur'ites, Rur'ity

which detract from the readability of the abstracts, to say nothing of being downright unintelligible.

Abstracts are grouped into a great number of subject categories, the logic for which may be difficult for a non-sociologist to perceive. This is a great pity, because there is much information in each issue of *SA* which could be used by non-sociologists - if it were only possible to locate it. A subject index accompanies each issue, presumably to help in the location of abstracts. The following notice accompanies it:

OUR INDEX IS MACHINE READABLE AND SEARCHABLE

While I am convinced that computers can do almost anything they are instructed to, it is nevertheless true that humans would have neither an easy time reading nor searching the index, as an examination of the following entries under EDUCATION(AL)(TORS) /sic/ will reveal:

EDUCATION(AL)(TORS)

07 E5619 + POLICE COERCION
10 E5697 + WAR AGAINST POVERTY
14 E5742 + DECREASE IN NUMBER OF SUPERSTITIONS
24 E5791 ADULT, + ORGANIZATIONAL THEORY
15 E5827 ROLE OF, + DEVELOPMENT
19 E5975 + SOCIAL MOBILITY
20 E6005 UNIVERSITY + PRESTIGE OF PROFESSION
18 E6081 A COURSE IN URBAN SOCIOLOGY
31 E6156 ROLE OF FILM IN THE AREA OF MUSIC
32 E6165 HIGHER, A CHALLENGE TO
32 E6177 SYSTEMS + STUDENT REBELLION
32 E6178 SOCIOLOGY, USE OF TYPOLOGIES IN
32 E6179 POLICY MAKING PROCESS + PROBLEM SOLVING APPROACH
32 E6180 + DESEGREGATION
32 E6181 ENVIRONMENT + SCHOOL ACHIEVEMENT
32 E6183 SYSTEMS IN LATIN AMERICA
32 E6184 METHODOLOGY, INNOVATIONS IN
32 E6185 IMPROVEMENT IN, RESEARCH + DEVELOPMENT ON
32 E6186 FOR DEMOCRACY + CITIZENSHIP + LEARNING IN SCHOOLS
32 E6188 + ETHNIC GROUPS
32 E6189 SCIENCE + EMPHASIS ON
32 E6193 SOCIAL WORK, + KNOWLEDGE
32 E6194 TECHNICAL, + SOCIAL CHANGE
32 E6196 SOCIOLOGY OF, BIBLIOGRAPHY OF
32 E6198 HIGHER, ASPECTS OF DEMOCRATIZATION
32 E6199 RELEVANCE OF, FOR BLACK AMERICANS
32 E6200 IN UK, CENTRAL CONTROL OF
32 E6203 REFORM IN TRENTON, N.J.
32 E6207 FACTORS IN ALGERIA
32 E6209 EXPECTATIONS + RELIGIOUS CONTEXT
32 E6210 ALTERNATIVE MODELS IN
32 E6211 FAILURE OF
32 E6212 JEWISH, PROBLEMS OF
32 E6214 SYSTEM, TRANSFORMATION OF
32 E6215 + SOCIAL + ECOLOGICAL BACKGROUND
32 E6216 ADULT, PARTICIPATION IN
32 E6217 SYSTEM + SOCIAL INEQUALITY IN DISTRIBUTION OF
32 E6218 PROCESS OF, SETTING OBJECTIVES FOR
32 E6221 SOCIAL WORK, IN INDIA
34 E6301 SCIENCE + SOCIETY
37 E6331 MIGRATION STATUS, + FERTILITY IN PUERTO RICO
37 E6343 PROGRAMS + PARTICIPATION IN BY US INDIANS
40 E6367 LEVEL + ATTITUDES TOWARD PROSTITUTION
41 E6370 PAREMT, + POVERTY FAMILIES
46 E6416 OF PSYCHIATRISTS
46 E6418 PROGRAM IN A DISADVANTAGED COMMUNITY

On second thoughts, computers can't have a very easy time with it either, as the 1968 cumulative index, produced by computer, was only issued in March 1971.

As explained earlier, none of the 88 items in the sample group chosen for study in this paper had yet been abstracted by *SA* up to the December 1970 issue, the latest available in Geneva at the time of writing (end June 1971). Even if one had been found, however, I would have thought twice about copying it because of this warning which appears in each issue:

> "No part of this book may be reproduced, transmitted or stored in any form or by any means, electronic or mechanical, including photocopying, recording, xeroxing, or by any information storage and retrieval system without permission in writing from Sociological Abstracts, Inc."

This is a troublesome thought, because the human eye is an extremely complex optical character recognition device, and the human brain one of the most ingenious information storage and retrieval machines yet designed. Fortunately, just a few pages after this warning, appears a full-page advertisement with an enormous headline in startling black type:

PHOTOCOPY SERVICE !

in which *SA* offers to provide users with photocopies of original articles for $ 2.00 per ten pages. However, it is clearly stated that "*Sociological Abstracts* follows the 'fair use' interpretation of the copyright law. Therefore, *Sociological Abstracts* does not sell photocopies but merely performs the service of copying."

Co-operative Educational Abstracting Service (CEAS)

Unesco. International Bureau of Education, Palais Wilson, Geneva, Switzerland. 1968- . Loose-leaf service. Price not yet determined.

Circulation - 3,500 English, 3,500 French

CEAS abstracts are quite different from the various other types of indicative or informative abstracts. They attempt to summarise the original document in sufficient detail so that consultation of the original may not in all cases be required. The abstracts are prepared by national centres and are highly selective. They are intended to provide educational policy-makers and administrators at a high level with substantive information that may be useful in the framing of educational policies.

Some 160 *CEAS* abstracts have been issued to date as part of an experimental service. It is intended to extend the number of these to a target figure of some 225-250 per year in the near future. They are issued in loose-leaf form so that the recipients may file them in the order which they find most convenient for their use, for example, by country or by subject. Very good guidelines for the selection of documents and for preparing abstracts have been published, and are available from the IBE (document CEAS/70/1 - Technical and procedural guides, no. 1).

Example 12
(abstract total 123 lines)

Classification (for the use of receiver)	Country Australia No. 14	CEAS No. 70/3 E Date of issue October 1970

Author	Industrial Commission of New South Wales
Title	*The Apprenticeship System in New South Wales*
Bibliographical data	Sydney, New South Wales Government Printer, 1969. 638 p.
Translation	
Keywords	Australia educational policy apprenticeship system - shortage - training apprenticeship advisory council

...l of Education
...e, Switzerland

The terms of reference for the Commission were to report on: the functioning of the apprenticeship system in New S... including consi... ...ended for the ... ... the functioning of the apprenticeship system and the supply of skilled tradesmen.

...ions Educational,
...d Cultural Organization
Educational Abstracting S...

The Commission found that while apprenticeship provided the best method of producing skilled tradesmen there had been a shortage for some years in certain trades ... were likely to contin... young me...

...country areas where ... restricted. The maximum length ... trade courses should be three years and should not make provision for study in advanced topics.

The report also contains tables of statutes, cases and awards.

Abstract prepared by the Australian Council for Educational Research.

CIRF Abstracts

CIRF Publications, Vocational Training Branch, International Labour Office, 1211 Geneva 22, Switzerland. v.1- ; 1962- . Loose-leaf service. 6 times a year. $ 10.00. Subscription price also includes ring binder and journal *Training for Progress*.

Circulation - 1,100 English, 600 French. Subscribers include institutions of higher education (25%), industrial undertakings (30%), public and private educational authorities, training boards, etc (22%), training specialists and consultants (23%).

Input to *CIRF Abstracts* is prepared by the staff of ILO's Vocational Training Branch. Thousands of documents are scanned annually in the field of vocational training, vocational guidance and education and manpower insofar as the latter relate to vocational training. Documents considered of major importance on new developments, ideas and approaches are chosen, and some 300-350 extensive summaries are written and published each year in English and French. These abstracts, of some 400 words in length, may in many cases provide sufficient information to replace consultation of the original document.

Abstracts are issued on loose-leaf sheets for filing in 15 subject categories in special ring binders. A new binder is supplied with the first bi-monthly batch of abstracts each year. Shorter indicative or semi-informative abstracts of the same documents, except for legislative texts, are also published in the semi-monthly bulletin *International Labour Documentation*. The *ILD* abstracts are recorded in machine-readable form to permit co-ordinate searching by computer. The *ILD* entry number appears in the upper left-hand corner of each *CIRF Abstract*.

A number of classification suggestions are also provided with many of the abstracts, such as the sector of economic activity (UN code), the occupational group (ILO code), the UDC country code, etc. Annual indexes by author, subject and country are also issued. Each abstract contains a "subject analysis" and a "contents analysis". The former describes in concise form the nature of the document and the central analytical area covered. The latter is intended to convey the essential ideas, facts, opinions, conclusions and reservations contained in the original text.

A sample of a *CIRF Abstract* is given on the next page. The following subject terms have been assigned to this abstract, and will appear in the annual subject index at the end of 1971:

Disadvantaged Persons, Research

Another abstract of the same document has been included in this paper as Example 8 (*PHRA*).

Example 13
(abstract total 64 lines)

In referring to this abstract please quote	Trainee	Sector	ISCO	CIRF	Country
N° B 39562	-	-	-	2	United States of America 73

Author: DAVIS, E.E.

Title: A study of low-wage workers and their response to high intensity training

Bibliographical references: New York, Skill Advancement Inc., 1969: Technical Memorandum RES.200, Vol. I, 243 p. (mimeo.)

Translation:

Subject analysis: Report on a research project to assess the feasibility of upgrading low-skill, low-wage personnel: objectives, research method, findings (employee characteristics: effects of the training on trainee attitudes and performance, validity of pre-tests for assessing trainee success).

Contents analysis:

CIRF Publications, International Labour Office, CH 1211 Geneve 22 Switzerland

Background

In 1966 the US Department of Labor concluded a contract with Skill Advancement Inc. (SAI) to undertake a research project to plan, develop and demonstrate means of aiding and encouraging employers to establish upgrading programmes to enable low-skill workers already employed to advance to higher skilled jobs. SAI agreed to train and upgrade 1,500 low-skill, low-wage workers, using for the purpose a "high intensity training (HIT) model" developed in an earlier project undertaken by SAI (with a grant from the New York City Anti-Poverty Operations Board) in 5 major New York City industries with good growth potential and employing large numbers of such low-wage, low-skill workers (hospitals, plastics, electrical components, restaurants, retail groceries).

The project had three specific objectives: to obtain (1) a descriptive analysis of the subjects, (2) an analysis of the effect of the training programme, (3) an analysis of variables bearing on trainee selection and success.

Research method

Data were derived from interviews bearing on demographic and other background variables and questions relating to reported behaviours, aspirations, perceptions, attitudes and values. 810 persons were interviewed: low-wage employees (E = 666) and their first-line supervisors (S = 154) from 7 hospitals and 4 manufacturing firms in New York City. The interviews were conducted during working hours, individually, in private and on the job site, by trained interviewers.

Characteristics of the sample

The groups comprised whites and non-whites in the following proportions: E — white 28%, Negro 60%, Puerto Rican and other non-white 12%; S — white 57%, Negro 36%, Puerto Rican 7%. The employees were

(cont'd)

attitudes and judgments may be important success determinants in manpower training programmes.

Statistical tables; short bibliography.

International Labour Documentation (ILD)

International Labour Office, Central Library and Documentation Branch, 1211 Geneva 22, Switzerland. v.1- ; 1965- . Semi-monthly. $ 10.00. Cumulations available from a commercial publisher.[1]

Circulation - 1,000 in bulletin form and 105 in card form (the latter not available for external distribution).

Also available on 9-track magnetic tape (1600 BPI) in the format of the proposed ISO Recommendation on Bibliographic Information Interchange. The average record length is 530 characters.

Input to *ILD* is international in coverage, and comprises abstracts of books, journal articles, research reports, textbooks, conference papers and government documents in the fields of labour relations, manpower, educational planning, vocational training, management, conditions of work, etc. 1,085 journals are regularly scanned. At the present writing (June 1971) some 43,500 abstracts are in the machine-readable file, incrementing by approximately 720 new entries per month. The source documents, about which information has been recorded, are in 55 languages (English - 53.5%, French - 19.5%, Spanish - 8.5%, German - 7.5%, Russian - 4.5%, all others - 6.5%).

An indicative or semi-informative abstract of each document is prepared. Rather than assigning descriptors in a separate part of the record, the relevant descriptors are embedded in the text of the abstract and are differentiated from the surrounding free text by slashes. The slashes can, of course, be suppressed from printing, as is the case in subject indexes, but they are retained in the current awareness bulletin and on the cards to facilitate manual filing. In addition, certain terms are underlined and these are filed in the library's card catalogues as if they were subject headings, in the example given overleaf, they would be filed as follows:

DROPOUT - USA

TEACHING METHOD - USA

The abstract is divided into two parts: the first part which contains those descriptors which express the form of document, the methodology employed and the major subject emphasis, and a second part, following a hyphen used as a separator, containing descriptors which represent subsidiary topics covered. In other words, in Example 14, the descriptors

TEACHER, TEACHING METHOD, BEHAVIOUR, DROPOUT, YOUTH and SECONDARY EDUCATION

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[1] *International Labour Documentation Cumulative Edition, 1965-1969.* Boston, G.K. Hall and Co., 1971. 8 v. (5,334 pages). $ 475.00 Entirely computer-produced, contains 32,000 abstracts with author and country indexes and detailed subject index (nearly ½ million entries). The next cumulation will cover the years 1970-1971.

Example 14
(for another abstract of the same document, see *RIE*, Example 4)

39381 1969 70A971
RALSTROM SE
BELIEFS OF INDUSTRIAL EDUCATION TEACHERS REGARDING THEIR TEACHING PRACTICES FOR PREVENTING DROPOUTS.
<DETROIT>, WAYNE STATE UNIVERSITY, 1970. XXII, 667 L. TABLES, DIAGRS., MAP.
/USA/. /THESIS/ ON A /SURVEY/ BASED ON /INTERVIEW/S WITH 115 /TEACHER/S TO EVALUATE THE IMPACT OF /TEACHING METHOD/S AND /BEHAVIOUR/ ON THE /DROPOUT/ RATE AMONG /YOUTH/ UNDERGOING /VOCATIONAL TRAINING/ AT THE /SECONDARY EDUCATION/ LEVEL - INCLUDES /STATISTIC/S ON THE /SOCIAL STATUS/ OF DROPOUTS, SELF/EVALUATION/ OF TEACHERS' 'HOLDING POWER' AND THE /PSYCHOLOGICAL ASPECT/S OF PREVENTING DROPOUTS AND STRESSES THE IMPORTANCE THEREOF IN THE LIGHT OF /EMPLOYMENT/ PROBLEMS FACING YOUNG /UNSKILLED WORKER/S. /BIBLIOGRAPHY/ PP. 660 TO 664.
ENGL

are equivalent to the asterisked descriptors in the various ERIC and NTIS services.

Certain form descriptors convey a different meaning depending on which part of the abstract they are located in. If the descriptor /BIBLIOGRAPHY/ appears before the hyphen, it would indicate that the document is itself a bibliography. On an average, 10.2 descriptor postings have been made per document. There is no limitation on the number of permissible "major" descriptors per document, but there is an over-all limitation of 1,000 characters for the total record length. This is done so that all entries can fit on a standard 5" x 3" (75 x 125 mm) catalogue card. These are prepared, together with *ILD* itself by photo-offset reduction of the original computer printout.

The date appearing at the top of each entry is the date when the document was written, and not necessarily the publication date. The number on the right is the call number, or stack location code for the book in the ILO Library. The language of the source document is always recorded, as it has been found that in an international environment requests for searches are frequently received which contain language restrictions.

The abstracts are not arranged in any order, but merely listed in sequence as they are recorded in the system. The only index which is printed with each semi-monthly issue of *ILD* is a very simple subject index listing each subject descriptor with the numbers of the entries in which that term had been used. The semi-monthly *ILD* is only useful, therefore, as a current awareness bulletin, as it would be too cumbersome to attempt to undertake a retrospective subject search on the basis of that index alone.

For retrospective searching a number of manual and machine methods exist. The ideal would be to design a printed index which would permit complex co-ordinate searches to be carried out manually while at the same time not be overly voluminous. A compromise solution, which is still quite massive, is shown on the next page. This page is taken from the subject

EDUCATIONAL PLANNING (CONT.)

29766 SPAIN. MONOGRAPH ON DEVELOPMENTS AND TRENDS IN EDUCATIONAL POLICY AND EDUCATIONAL PLANNING IN WESTERN EUROPE, WITH PARTICULA
00955 SPAIN. OAS PUB CONFERENCE PAPER ON SOCIAL PLANNING FOR HUMAN RESOURCES IN MEDITERRANEAN COUNTRIES - GREECE, ITALY, PORTUGAL,
02139 SPAIN. OECD PUB. ECONOMIC DEVELOPMENT BRINGS OUT MANPOWER NEEDS, WHICH RESULT IN EDUCATIONAL NEEDS. ECONOMETRIC RESEARCH MET
05090 SPAIN. OECD PUB. HOW TO STUDY TRENDS OF EDUCATIONAL NEEDS IN A PROCESS OF ECONOMIC DEVELOPMENT WITH NEW MANPOWER NEEDS. A SH
09599 SPAIN. REPORT AND STATISTICS ON NATIONAL EDUCATION SHOWING RESULTS OF EDUCATIONAL PLANNING BEGUN IN 1966. INCLUDES PRIMARY E
27491 SPAIN. REPORT ON EDUCATIONAL PLANNING NEEDS IN SPAIN, WITH PARTICULAR REFERENCE TO ORGANISATIONAL REFORMS IN RESPECT OF HIGH
09444 SPAIN. STRUCTURE AND EVOLUTION OF TRADE UNION MOVEMENTS, THEIR ACTIVITIES IN THE FIELDS OF INDUSTRIAL WORKERS AND RURAL WORK
11978 SPAIN. 1964-1967 NATIONAL PLAN IN RESPECT OF EDUCATIONAL PLANNING - COVERS PRIMARY EDUCATION, SECONDARY EDUCATION, VOCATIONA
32140 STUDY IN ECONOMIC THEORY OF INPUT OUTPUT ASPECTS OF EDUCATION AND EDUCATIONAL PLANNING - COVERS HUMAN RESOURCES DEVELOPMENT,
22997 STUDY OF AIMS OF EMPLOYMENT POLICY AND EDUCATIONAL PLANNING IN THE LIGHT OF THE EFFECT ON EMPLOYMENT OF TECHNOLOGICAL CHANGE
18193 STUDY OF FINANCING PROBLEMS AND ECONOMIC IMPLICATIONS OF EDUCATION - INCLUDES RELEVANT ECONOMIC THEORY, AND COVERS GROUP DYNA
31306 SUDAN. REVISED OUTLINE OF EDUCATIONAL PLANNING IN RESPECT OF THE PERIOD FROM 1969-70 TO 1973-74 - INCLUDES BUDGET ESTIMATES,
09909 SUDAN. UNESCO PUB. EDUCATIONAL PLANNING IN AFRICA, TRENDS AND FORECAST. PROGRESS REPORT. PRIMARY EDUCATION IN MALAGASY REP.
31540 SWAZILAND. NATIONAL PLAN FOR ECONOMIC DEVELOPMENT IN SWAZILAND FOR THE PERIOD FROM 1969 TO 1974 - COVERS AGRICULTURAL POLICY
29009 SWEDEN. ANNUAL REPORT COMPRISING A SUMMARY OF THE DRAFT BUDGET OF SWEDEN AND REVIEW OF GOVERNMENT POLICY IN RESPECT OF PUBLI
13771 SWEDEN. ARTICLE ON EDUCATIONAL PLANNING TO INCORPORATE VOCATIONAL TRAINING INTO THE SECONDARY EDUCATION SYSTEM IN 1970 - COV
14138 SWEDEN. ARTICLE ON EDUCATIONAL PLANNING IN SWEDEN TO IMPROVE TEACHER TRAINING IN THE FIELD OF FORESTRY, WITH PARTICULAR REFE
06147 SWEDEN. CONCERNS A EUROPEAN CONFERENCE ABOUT EDUCATIONAL PLANNING. SUMMARY OF REPORTS (FRANCE, ITALY, SWEDEN, BELGIUM AND SW
17373 SWEDEN. CONFERENCE REPORT ON AN INTERNATIONAL SEMINAR TO STUDY PROBLEMS OF EDUCATIONAL PLANNING - INCLUDES RECORDS OF LECTUR
04343 SWEDEN. OBSERVATIONS ON PUBLIC VOCATIONAL GUIDANCE. THE EMPLOYMENT POLICY IS NOT TO ENCOURAGE OCCUPATIONAL CHOICE ACCORDING
16162 SWEDEN. OECD PUB COMPRISING A SERIES OF ARTICLES RESULTING FROM AN O.E.C.D. MEETING ON THE RELATIONSHIP OF HUMAN RESOURCE FO
30826 SWEDEN. OECD PUB. CONFERENCE PAPER ON THE RELATIONSHIP OF EDUCATIONAL PLANNING AND MANPOWER PLANNING IN SEEKING SOLUTIONS TO
13450 SWEDEN. PRESENTATION OF EDUCATIONAL PLANNING POLICY, AS PART OF EMPLOYMENT POLICY, IN RESPECT OF PRIMARY EDUCATION, SECONDAR
10881 SWEDEN. REFORMS IN THE SCHOOL SYSTEM RESULTING FROM RECENT EDUCATIONAL PLANNING PROVIDING FOR A NINE YEAR PERIOD OF PRIMARY
19176 SWEDEN. STUDY OF TRENDS IN EDUCATIONAL PLANNING AND SCHOOL REFORMS (WITH PARTICULAR REFERENCE TO SWEDEN, VARIOUS OTHER EUROP
4980 SWEDEN. SURVEY OF SOCIAL RESEARCH PROJECTS UNDERTAKEN IN SWEDEN SINCE 1940 AND RELATED TO EDUCATIONAL REFORMS - COVERS PROJE
29439 SWITZERLAND. ARTICLE ON PROBLEMS OF EDUCATIONAL PLANNING IN SWITZERLAND, WITH PARTICULAR REFERENCE TO THE NEED FOR COORDINAT
14471 SWITZERLAND. ARTICLE ON THE NEED FOR BETTER EDUCATIONAL PLANNING - COVERS THE LOCATION, NUMBER, AND SIZE OF VOCATIONAL TRAIN
06147 SWITZERLAND. CONCERNS A EUROPEAN CONFERENCE ABOUT EDUCATIONAL PLANNING. SUMMARY OF REPORTS (FRANCE, ITALY, SWEDEN, BELGIUM A
04996 SWITZERLAND. CONFERENCE REPORT (GROUP DISCUSSION). HOW TO FORECAST TRENDS IN MANPOWER NEEDS IN ORDER TO COORDINATE MANPOWER
09105 SWITZERLAND. CONFERENCE REPORT, FORECAST OF EMPLOYMENT OPPORTUNITYS ENABLING UNIVERSITY GRADUATES TO BECOME PROFESSIONAL WOR
09252 SWITZERLAND. EDUCATIONAL PLANNING TO UPGRADE COMMERCIAL EDUCATION, CURRICULUM GIVEN.
27718 SWITZERLAND. EXAMINATION OF ECONOMIC IMPLICATIONS AND SOCIAL IMPLICATIONS OF GOVERNMENT POLICY IN SWITZERLAND IN RESPECT OF
11624 SWITZERLAND. STUDY OF THE ROLE OF EDUCATION IN ECONOMIC DEVELOPMENT, INCLUDING COMPARATIVE STUDY OF THE POSITION IN THE UK,
26856 TANZANIA. ARTICLE ON TRENDS TOWARD CENTRALISATION OF EDUCATIONAL PLANNING AND ADMINISTRATION IN MAINLAND TANZANIA - COVERS G
07316 TANZANIA. JOINT EDUCATIONAL PLANNING IN KENYA, TANZANIA AND UGANDA. BASIC NEED FOR ECONOMIC DEVELOPMENT IS A NEW SOCIAL STRU
10792 TANZANIA. SURVEY OF EDUCATIONAL AND VOCATIONAL TRAINING OPPORTUNITIES IN EAST AFRICA - COVERS EDUCATIONAL NEEDS AND THE ECON
12998 TANZANIA. UNESCO PUB. AFRICAN RESEARCH STUDY OF THE COST AND FINANCING OF EDUCATIONAL PLANNING IN TANZANIA - COVERS STATISTI
12999 TANZANIA. UNESCO PUB. AFRICAN RESEARCH STUDY OF RELATIONSHIP OF EDUCATIONAL PLANNING, ECONOMIC PLANNING AND MANPOWER PLANNIN
13001 TANZANIA. UNESCO PUB. AFRICAN RESEARCH STUDY OF EDUCATIONAL PLANNING AS RELATED TO RURAL DEVELOPMENT IN TANZANIA - COVERS EX
14736 TANZANIA. UNESCO PUB. CASE STUDY OF TANZANIA AS AN EXAMPLE OF THE PROBLEMS ENCOUNTERED IN EDUCATIONAL PLANNING IN DEVELOPING
16531 TANZANIA. UNESCO PUB. STUDY OF NON-FORMAL EDUCATIONAL PLANNING IN TANZANIA - COVERS COMMUNITY DEVELOPMENT, RURAL DEVELOPMENT
13044 TANZANIA. UNESCO PUB. STUDY OF THE LEGAL ASPECTS OF EDUCATIONAL PLANNING AND ADMINISTRATION IN KENYA, TANZANIA AND UGANDA -
13146 TEXTBOOK ON EDUCATIONAL PLANNING IN THE PREPARATION AND REVISION OF TRAINING PROGRAMMES FOR VOCATIONAL TRAINING - INCLUDES TH
26827 THAILAND. CONFERENCE REPORT ON A MEETING TO EXAMINE PROBLEMS OF MANPOWER PLANNING AND EDUCATIONAL PLANNING IN SOUTH EAST ASI
29293 THAILAND. NATIONAL PLAN OF THAILAND FOR THE PERIOD FROM 1967 TO 1971 - COVERS AGRICULTURAL POLICY, ECONOMIC POLICY, EMPLOYME
23300 THAILAND. REPORT ON EDUCATIONAL PLANNING IN THAILAND, WITH PARTICULAR REFERENCE TO DETERMINING THE EXTENT TO WHICH THE SECON
29492 THAILAND. REPORT ON EDUCATIONAL PLANNING IN RESPECT OF VOCATIONAL TRAINING IN THAILAND FOR MANPOWER PLANNING PURPOSES - COVE
28623 THAILAND. UNESCO PUB. BRIEF PRESENTATION OF THE MAIN FEATURES OF THE ORGANISATION AND PROCESS OF EDUCATIONAL PLANNING IN COU
20342 THAILAND. UNESCO PUB. SURVEY OF EDUCATIONAL DEVELOPMENTS IN ASIA - COMPRISES REPORTS FROM AFGHANISTAN, CAMBODIA, INDIA, IRAN
29472 THEORETICAL ARTICLE ON THE APPLICATION OF MANPOWER SUPPLY AND DEMAND ANALYSIS METHODOLOGY IN EDUCATIONAL PLANNING - COVERS EC
28118 TRINIDAD AND TOBAGO. DRAFT OF THE 1969-1973 NATIONAL PLAN OF TRINIDAD AND TOBAGO - INCLUDES INFORMATION ON FINANCING AND IMP
10252 TUNISIA. NATIONAL GOVERNMENT POLICY CONCERNING GENERAL AND SOCIAL PROTECTION OF CHILDREN, MATERNITY BENEFITS, HEALTH SERVICE
01379 TUNISIA. NATIONAL PLAN OF TUNISIA, NATIONAL BUDGET, SERIES OF TABLES GIVING DETAILS OF INVESTMENT FOR ECONOMIC PLANNING (IND
30492 TUNISIA. REPORT ON MANAGEMENT DEVELOPMENT NEEDS AND ACTIVITIES IN INDUSTRY IN TUNISIA - COVERS MANAGERIAL MANPOWER NEEDS, RE
00595 TURKEY. EDUCATION IN OECD COUNTRYS AND IN DEVELOPING COUNTRYS LINKED TO ECONOMIC DEVELOPMENT. EDUCATIONAL PLANNING IN GREECE
00955 TURKEY. OAS PUB CONFERENCE PAPER ON SOCIAL PLANNING FOR HUMAN RESOURCES IN MEDITERRANEAN COUNTRIES - GREECE, ITALY, PORTUGAL
08955 TURKEY. OECD PUB TURKEY, EVALUATION OF EDUCATIONAL NEEDS IN RELATION TO MANPOWER NEEDS AS PART OF ECONOMIC DEVELOPMENT. EDUC
02139 TURKEY. OECD PUB. ECONOMIC DEVELOPMENT BRINGS OUT MANPOWER NEEDS, WHICH RESULT IN EDUCATIONAL NEEDS. ECONOMETRIC RESEARCH ME
05091 TURKEY. OECD PUB. HOW TO STUDY TRENDS OF EDUCATIONAL NEEDS IN TURKEY. A SHORT STUDY OF THE EDUCATIONAL SYSTEM IS FOLLOWED BY
14369 TURKEY. STATISTICAL REPORT ON MANPOWER NEEDS AND EDUCATIONAL PLANNING IN TURKEY FOR THE PERIOD FROM 1962 TO 1977 - INCLUDES
25585 TURKEY. STUDY OF HISTORICAL BACKGROUND OF THE EDUCATIONAL SYSTEM IN TURKEY DURING THE PERIOD FROM 1920 TO 1960 - COVERS EDUC

Example 15

index of *International Labour Documentation, Cumulative Edition, 1965-1969.* Each subject descriptor is sorted by geographical descriptor, if one is present, or if not by the first word in the abstract. Then, within each geographical subdivision, such as EDUCATIONAL PLANNING - SWEDEN, the entries are sorted alphabetically by the first word of the abstract, which in most cases will be a form descriptor.

The first 100-110 characters of the abstract are then displayed. If the document analyst has properly followed the guidelines for abstracting, there should be enough information in those initial 100 characters to indicate to the user whether he wants to look up the full reference, recorded under the 5-digit entry number.

In this five-year cumulation all subject descriptor postings have been used to generate the subject index. It would be possible, of course, to use only major descriptors (pre-hyphen). This would, however, impose a restriction on users who were not in a position to search the computer file, or did not have time to refer the question to a centre which could do a machine search.

The ILO has recently published a description of the system by W. Schieber (9), which deals with the techniques used in inter-active on-line retrieval in some detail, and explains how other library operations have been integrated with this operation.

PRECIS System for Computer-Generated Indexes

Although not presently used by any abstract journal, PRECIS contains a number of features that make it sufficiently important to take into account within the framework of the EUDISED study. In September 1968, the *British National Bibliography* set up a research project to examine techniques for adding subject data in the form of descriptors to its machine-readable records, as well as to examine the possibility of using the terms in the descriptor string to provide the basis for a pre-coordinated subject index.

The research team ascertained that the descriptor project could form the basis of a new type of rotational indexing system. Described in a paper by Austin and Butcher (10), the PRECIS system became operational in 1971, and is being used to produce the monthly and cumulative subject indexes of the *BNB*. In addition it has been used by the National Council for Educational Technology to produce the subject index to an experimental catalogue of instructional materials, including films, videotapes, slide sequences, etc, within the framework of its Higher Education Learning Programmes Information Service (11).

It would be impossible to construct a meaningful string from ERIC or NTIS descriptor entries, because there is no logical order among the descriptors, except perhaps alphabetical, in the case of *RIE*. Using a system like that employed in *ILD*, where descriptors are related to each other in a natural language sentence, one could extract the subject descriptors and rotate them so that each in turn would appear as the lead term in a string.

Taking the abstract cited as Example 14, one would get as a first string:

TEACHER. TEACHING METHOD. BEHAVIOUR. DROPOUT. YOUTH. SECONDARY EDUCATION.

This is already a bit ambiguous, but it gets worse if the string were rotated and the third descriptor were to appear in the lead position:

BEHAVIOUR. DROPOUT. YOUTH. SECONDARY EDUCATION. TEACHER. TEACHING METHOD.

This might lead one to assume erroneously that the document deals with the behaviour of dropouts, rather than that of teachers, as was clear in the original natural language statement.

PRECIS is able to preserve the correct meaning of a set of index entries by assigning descriptors in such an order that one term establishes the wider context in which the next term had been considered by the author. This operation is called concept analysis. Then manipulation codes are prefixed to each descriptor so that the computer can recognise how it is to treat it in relation to the other terms when it starts to construct a set of entries out of a single string of descriptors.

A very simple illustration would be a document dealing with the management of railways in France, for which the following strings would be produced by the computer:

FRANCE
Railways. Management

RAILWAYS. France
Management

MANAGEMENT. Railways. France.

Although it can be assumed in this example that the railways don't manage the country, PRECIS eliminates possible misinterpretations.

In a more complex example, let us assume that we have a document dealing with the activities of the University of Ottawa in the field of adult education in rural communities of the Province of Ontario. The concept analysis would read as follows:

(6) Canada (4) Rural communities (3) Adult education
(3) Role - of - in (2) University of Ottawa (0) Study region / Ontario

The numbers in brackets refer to a code of "relators"; in this particular example the relators chosen are:

(0) - Study region, sample population

(2) - Active concept

(3) - Effect, action

(4) - Key system

(6) - Environment

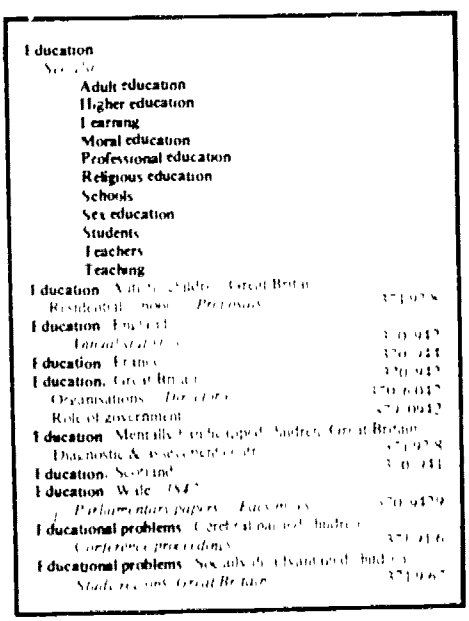
When the manipulation codes are added, the computer then generates automatically the following entries:

ADULT EDUCATION. Rural communities. Canada
  Role of University of Ottawa - *Study region: Ontario*
CANADA
  Rural communities. Adult education. Role of University
    of Ottawa - *Study region: Ontario*
ONTARIO. *Study region*
  Canada. Rural communities. Adult education. Role of
    University of Ottawa
RURAL COMMUNITIES. Canada
  Adult education. Role of University of Ottawa -
    Study region: Ontario
UNIVERSITY OF OTTAWA. Role in adult education. Rural communities
  Canada - *Study region: Ontario*

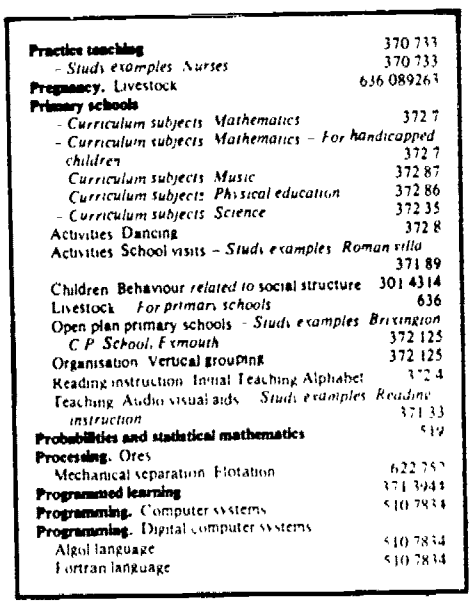
The existence of a descriptor in a PRECIS string which is linked to another term in the thesaurus provokes the printing of an appropriate cross reference in the printed subject index. In this particular instance, ADULT EDUCATION would automatically provoke an entry

EDUCATION
see also
ADULT EDUCATION

A few entries under the term EDUCATION are reproduced below from the PRECIS index to the April 1971 subject index of *BNB*; and from the experimental index to instructional materials:



Education
Adult education
Higher education
Learning
Moral education
Professional education
Religious education
Schools
Sex education
Students
Teachers
Teaching
Education
Education
Education
Education
Education
Education
Educational problems
Educational problems



Practice teaching 370 733
- *Study examples Nurses* 370 733
Pregnancy. Livestock 636 089263
Primary schools
- *Curriculum subjects Mathematics* 372 7
- *Curriculum subjects Mathematics – For handicapped children* 372 7
Curriculum subjects Music 372 87
Curriculum subjects Physical education 372 86
- *Curriculum subjects Science* 372 35
Activities Dancing 372 8
Activities School visits – *Study examples Roman villa* 371 89
Children Behaviour *related to* social structure 301 4314
Livestock *For primary schools* 636
Open plan primary schools – *Study examples Brixington C P School, Exmouth* 372 125
Organisation Vertical grouping 372 125
Reading instruction Initial Teaching Alphabet 372 4
Teaching Audio visual aids *Study examples Reading instruction* 371 33
Probabilities and statistical mathematics 519
Processing. Ores
Mechanical separation Flotation 622 757
Programmed learning 371 3944
Programming. Computer systems 510 7834
Programming. Digital computer systems
Algol language 510 7834
Fortran language 510 7834

In both examples, the number at the right of each subject entry refers to the section of the Dewey Classification under which the complete entry can be found.

The *NIR* team has also been experimenting with producing meaningful PRECIS statements in other languages, namely Czech, German, Russian and Sinhalese. First results would appear to indicate that the technique can be successfully applied to languages other than English.

COMPARISON OF DIFFERENT SERVICES

There are a number of acid tests which should be applied to each of the indexing and abstracting services in order to determine how well - and how efficiently - they are fulfilling the current awareness and retrospective search functions. Ideally a number of factors should be taken into account:

coverage, timeliness, cost and quality (relevance, specificity and ease of use)

What complicates the exercise is that different types of information users will have different requirements for each of these elements.

A considerable amount of data concerning each service has been given in the descriptive sections. These data may be used to undertake a number of analyses; I shall address my comments mainly to the quality of the services, after a few preliminary words about coverage, timeliness and cost.

Coverage of services is always difficult to determine. The proliferation of services is partly due to the fact that most of their producers probably suspect that other services' coverage is either poor, or slanted to a different type of audience. *CIJE* indicates which journals it scans, and which ones are indexed cover-to-cover. However, it cannot guarantee complete coverage of American journal articles on education. In this sample exercise, several were found which had been abstracted by *CIJE*, *RIE* and others but had not been picked up by *CIJE*. The West German Educational Documentation Network (Dokumentationsring Pädagogik) publishes an annual list of periodicals scanned, indicating not only which journals are indexed cover-to-cover, but also which specialised clearinghouse is responsible for the scanning and indexing of each title (12). From this examination of several different services in the field of education, it is obvious that considerable overlapping and scattering do exist; but there is also a phenomenon of "underlapping", where certain materials are not methodically covered by any service.

Timeliness has been well covered by the Dews study mentioned earlier. Certain categories of users may be able to tolerate a time lage of one to two years between the date of primary publication and the date of publication of an abstract; this would certainly not be true in vocational training or educational technology, and no doubt other illustrations could be found as well.

Cost is a touchy subject. Some of the services described in this paper are very expensive to operate, and of course the more informative the abstracts the higher their preparation cost. Bourne (13) has recently done a literature review of abstracting and indexing costs which analyses information about 24 abstract journals and 41 indexing services. To over-simplify the findings of this present comparison, I believe that it is true

to state that those services which devote the greatest effort to producing highly informative abstracts are doing the least to ensure that tools are provided so that these abstracts can be located in subject searches.

This fact has led me to concentrate in this comparison on one aspect only, which is a certain measure of the quality of the service: how easy is it to locate relevant abstracts in current issues of the different journals, in cumulative indexes or with computers when undertaking subject searches? Four rankings of the different services have been made. The relative positions of each of the services should be taken with a grain of salt, as in some cases not enough information was at hand to make a proper estimation; however, the rankings are, hopefully, rather "intelligent guesses".

A) *Ranking of the services on the basis of the number of subject access points provided in each individual issue*

(1) - ILD (8 Postings/Document, based on 40,000 records)
(2) - RIE (4 Postings/Document, based on 34,859 records)
(3) - CIJE, SEA, TAS
(4) - GRA
(5) - PHRA
(6) - TEA

B) *Ranking of the services on the basis of the number of subject access points provided in machine-readable files*

(1) - RIE (10.5 Postings/Document, based on 34,859 records)
(2) - CIRF, ILD (10.2 Postings/Document, based on 40,000 records)
(3) - GRA
(4) - CIJE

C) *Ranking of the services on the basis of the depth of information available in the printed subject indexes of individual issues*

(1) - CIJE
(2) - GRA, RIE
(3) - ILD, PHRA, SEA, TEA

D) *Ranking of the services on the basis of the depth of information available in cumulative printed subject indexes*

(1) - ILD
(2) - CIJE
(3) - GRA, RIE
(4) - CIRF, SEA, TEA

It should be noted that PRECIS would rank very high, probably between first and second place under A, C and D. Although PRECIS statements exist in machine-readable form, it is not known whether they will be used to generate inverted files for on-line retrieval, so it is difficult to guess how they would rank under B, probably in last place. These four rankings only indicate, however, "what is there" but not how easy or difficult it is to find one's way around in the various subject indexes. Two things still need to be answered:

1) How does one get from a statement of a question in natural language to the appropriate entry term in the index of an individual issue?

RIE and *CIJE* recommend that users consult the *Thesaurus* when using the subject indexes. In on-line computer searching, such as that done by both ERIC and ILO, it should be possible to have the appropriate parts of the thesaurus displayed on the terminal's TV screen as required. By linking up the indexing function with a thesaurus maintenance processor, BNB-PRECIS is taking an important step in the right direction, as computer-generated cross references or lead-in terms can be inserted automatically into the indexes themselves. This is an enormous advantage for the user who is not familiar with the indexing vocabulary.

2) Because of terminology changes, how does one undertake retrospective searches efficiently?

A good discussion of this problem is contained in Goodman's introductory chapter to the ERIC Thesaurus (4). He explains that for practical reasons when a new descriptor should replace one formerly in use, the outmoded descriptor, with all its postings, is left in the system, and a USE reference is placed under what should be the "preferred" term. He states that: "This kind of difficulty will not inhibit the functioning of the system if the Thesaurus is used, even though it may make the system appear inordinately 'authoritarian' or 'arbitrary'."

I would question to what extent the system is inhibited, but as a result, the Thesaurus inevitably becomes farther and farther removed from current usage. This, in turn, complicates both manual and machine searching. In fact, ERIC may have no way out of this dilemma. Even if it wished to do so, it would not be possible to retroactively update outmoded terms because descriptors have been recorded *out of context*. Therefore only simple 1:1 substitutions could be made, if, for example, it were decided to substitute BLACK for NEGRO.

By contrast, both the ILO and the BNB-PRECIS systems enable "retroactive re-indexing" to take place because the descriptors have been recorded *in context*. In the case of the ILO this constant re-indexing activity has greatly contributed to the ease of operation of computer retrieval. Keeping the vocabulary dynamic is also of great value when printing specialised subject catalogues, as the descriptors remain as close as possible to contemporary usage.

CONCLUSIONS AND RECOMMENDATIONS

A number of different abstract services, manual and mechanised, have been described in this paper. Before arriving at any recommendations on future directions on the basis of this exercise alone, it may be worthwhile pausing to mention two important systems outside of the social sciences. The Auerbach Corporation recently prepared a study for the National Agricultural Library, as background information preliminary to the development of an international agricultural information system (AGRIS). In this study Wall (14) discusses the usefulness of a thesaurus as a switching device in the

.proposed network, and also comments on abstracts:

> "Abstracting standards were long controversial (indicative vs informative; biased toward a special readership or non-biased, long vs short, etc), but in recent years information facilities have become less choosy; an externally generated, relatively 'poor' but *free* abstract may be, in the overall picture, preferable to an internally generated, excellent but *costly* abstract. Problems of vocabulary control - needed to ameliorate sufficiently the terminological variations in viewpoint, in generality of viewpoint, and in semantics between information originators, 'middlemen' and users - are inseparably entwined with those of subject indexing, and hence are also subject to amelioration via thesaurus conventions"

. The Defense Documentation Center (formerly ASTIA), which had prepared the first documentary thesaurus in 1960, is now having second thoughts about formalised, controlled vocabularies, and in a recent paper Klingbiel (15) has set forth some ideas about what he sees as trends in the 1970s in this field:

> "The thrust of vocabulary development in DDC is to eliminate the need for a printed vocabulary by a user of the system. The machine-aided indexing system indexes from text in the natural language of the text."

He goes on to describe a system being developed at DDC which controls two types of vocabulary: technical terms which have been found in the text when indexing, and terms taken from bibliographic requests for information. It is thought that the latter will be the first significant vocabulary built expressly to reflect the user's viewpoint. A central processing system in the computer is used to maintain what he terms "carefully controlled posting points required for a successful information operation".

> "The natural language data base represents the intersection of the above sub-systems and reflects both the indexing vocabulary and the searching vocabulary. Its most visible characteristic will be the large number of lead-in terms in comparison with code (posting) terms. That ratio will not be less than 5 and potentially can be much greater. This ratio is a numerical indicator of the freedom from printed vocabularies provided the user while maintaining complete control of the actual posting points. This vocabulary can be printed out in any desired format forwhatever need exists. However, except for the professional maintenance personnel, the need for such printouts may not exist."

It is not clear whether the development of machine-readable data bases will lead to a reinforcement of the role of the "middlemen", namely librarians or documentalists, or whether on the contrary researchers will prefer to negotiate with information systems directly. In either case, it does seem obvious that there will be a continued need for secondary services in printed form for some time - but it is equally obvious that these must be in machine-readable form so that the data can be fed into a grid.

Jahoda (16) and Trystram (17) both postulate that individual researchers will interact with information systems. This will mean that more services will have to organise themselves to permit on-line retrieval, as performed already by ERIC and the ILO, rather than batched sequential searches. Sequential search systems are in hot water already because of long turn-around time and intolerably high computer processing time. It is assumed that decentralised stores of specialised material will be available for random access searching via remote terminals. The researcher will want to frame his questions in his own language, but natural language has constraints, which even the DDC would recognise, and EUDISED must work in a multi-lingual environment.

Of the various techniques examined in this paper, it would seem that those employed by the ILO and by the BNB hold the most promise for the development of a decentralised European multi-lingual information network. If a multi-lingual thesaurus is adopted, as Jean Viet has proposed in his paper published in this volume, there would be no problem of searching other countries' data as any language could be used to carry out a search by descriptor on the inverted file. By this technique the entire file is narrowed down to a sub-set which can then be searched if necessary for natural language text in whatever languages desired.

If the goal of the EUDISED system is defined as leading users to documents of potential interest, then this technique would work via computer for large data bases, or on a less sophisticated plane manually through printed indexes of the PRECIS type. It is therefore suggested that one would wish to use the computer in all phases of the operation: to produce current awareness bulletins, to produce cumulative indexes and for on-line retrieval. When users are led to documents in unfamiliar languages, they would be faced with the usual dilemma of deciding whether to get a translation, but at the input level the tremendous expense of translating all abstracts into all European languages would be avoided. Some abstracts will be translated anyway, and these translated abstracts could also be added to the data base.

Major documents could get the full CIRF or CEAS-type treatment, and there is no reason why the CIRF/CEAS abstracts should not be recorded in machine-readable form as well. In fact this provides an interesting compromise among the various techniques presently employed or proposed, as one would have a system with the built-in but necessary constraints of a thesaurus, coupled with a completely free natural language system capable of providing facts and not just references to documents containing facts.

In conclusion, then, what is proposed is a completely modular multi-tier system, somewhat resembling a pyramid. At the lowest level one would find, for example, references to journal articles which had been characterised only by a few descriptors. This is what is being done now by the Dokumentationsring Pädagogik, the data being prepared on a decentralised basis and fed into a central point where it is put into machine-readable form and used for producing the monthly *Bibliographie Pädagogik*. This might be done on a cover-to-cover basis for major journals so that nothing is overlooked. This is almost in the nature of an archival operation, ie recording the existence of a document because it is there. There is a danger, of course, that worthless documents will get into the system. This danger permeates any information system, but it will not go away simply by ignoring it!

At the next highest level one might find abstracts of the ILO type or PRECIS statements. Presumably these would be done on a more selective basis than the first level indexing. When these abstracts are written they should be added to the computer store to upgrade the existing record.

Moving up the pyramid, some services will wish to prepare informative abstracts, of the PHRA, SEA, TAS or SA type. There is no reason why these should not be added as well, resulting in yet another upgrading, and providing just that much more information that is available for computer searching. And at the top of the pyramid one would find the CIRF/CEAS abstracts, which are sort of an "elite", if for no other reason than because of their selectivity, as only some 500 abstracts are published per year.

Translations of abstracts could be inserted at any level in the pyramid. Now it is obvious that nobody would ever want to use every bit of information that had been recorded about every document, but it would be quite simple for individual users to define their parameters and to extract only those elements which they require and have these displayed or printed out in whatever format they designate.

Needless to say, none of this will come to pass overnight, but the problems involved are not machine problems, but human. Such a system opens up entire new vistas in the development of information exchange; many individuals may wish to remain cooped up in their little boxes and not take advantage of it. It will be interesting to see whether the professional community is willing to take up the challenge. Time will tell.

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ABBREVIATIONS

BNB - British National Bibliography

BPI - Bytes per inch

CEAS - Co-operative Educational Abstracting Service

CIJE - Current Index to Journals in Education

CIRF - Vocational Training Branch, International Labour Office

DDC - Defense Documentation Center, US Department of Defense

ERIC - Educational Resources Information Center, US Office of Education

EUDISED - European Documentation and Information System for Education, Council of Europe

GRA - Government Reports Announcements

IBE - International Bureau of Education, UNESCO

ILD - International Labour Documentation

ILO - International Labour Office

INFROSS - Investigation into information requirements of social scientists

ISIS - Integrated Scientific Information System, International Labour Office

ISO - International Organization for Standardization

NTIS - National Technical Information Service, US Department of Commerce

OSTI - Office for Scientific and Technical Information, UK Department of Education and Science

PHRA - Poverty and Human Resources Abstracts

PRECIS - Preserved Context Indexing System

SA - Sociological Abstracts

SEA - Sociology of Education Abstracts

TAS - Training Abstracts Service

TEA - Technical Education Abstracts from British Sources

UDC - Universal Decimal Classification

UN - United Nations

PROBLEMS IN COMPILING THE MULTILINGUAL EUDISED THESAURUS

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1. INTRODUCTION

The need to develop a documentation language for the storage and retrieval of data in the European Documentation and Information System for Education (EUDISED) is so amply demonstrated in the Working Party's report published by the Council of Europe in 1969 as to make any further discussion of the matter unnecessary; nor is there any need to review in detail the considerations of educational terminology set out by H.H. Strater in Volume III of that report, in a study entitled *Problems of thesaurus construction for education*. It is not the purpose of this study to throw light on the theoretical problems associated with the preparation of any thesaurus for documentation purposes, or even to gauge the difficulties which may arise in that connection in the rather special field of education; it is to provide a more down-to-earth definition of the actual operations that must be performed so that a language capable of making the system work can be developed within a very short time.

At this practical level, it is obviously necessary to concentrate on the characteristics specific to EUDISED, in particular the fact that it is a regional documentation network based on national documentation services that are better integrated in some countries than in others, and is itself part of a larger system under construction on a world-wide scale; a documentation language is meaningful only with reference to a particular information processing organisation, and it is this organisation that determines the content of the language and its manner of presentation. It is also essential to take account of languages developed for other systems, whether they are directly concerned with the educational sciences or with related disciplines (for example, sociology), since it is very likely that they will contain numerous elements that can be taken over; and in any case, with the prospect of a wider exchange of educational information, it is necessary that some degree of compatibility with those languages should be sought.

Before deciding on the procedure for developing the language of EUDISED, we shall therefore examine its functions within the proposed system and the decisions which those functions dictate. A critical study will likewise be made of the contents and presentation of the glossaries on which information processing systems are based in similar fields, so as to pick out the features best able to ensure the desired degree of compatibility with related documentation services.

2. FUNCTIONS OF THE EUDISED LANGUAGE

Any language is, of course, primarily a means of communication; the distinguishing feature of the EUDISED documentation language is that it penetrates further. This is due partly to the problems specific to education, but possibly still more to the fact that communication within EUDISED is to take place at several levels.

2.1 To fulfil its role effectively, the language which is to be the principal instrument of the European Documentation and Information System for Education must, first and foremost, be capable of identifying and transferring information from local sources within each member country. Considered from this standpoint, therefore, it is a *national* language prescribed, within the

country, for educational research and information centres of every kind. It must be sufficiently flexible to express different types of information, which may be data relating to institutions, researchers or teaching aids, or the actual contents of a document, and sufficiently extensive to cover sectors as varied as adult training, new teaching methods, the sociology of culture or the economics of education; it will then bring all viewpoints together under the general heading of "educational sciences", where all of its descriptors will be integrated. In this way the documentation services of different sectors will be harmonised and will find in this common language an ideal instrument for the interchange of information and a guarantee of cohesion. Furthermore, the language will spotlight the most original features of the teaching system by translating them into so many specific terms; these will attach themselves to generic descriptors and so set up some kind of relationship with neighbouring systems.

2.2 But important though it is, this national function is quite inadequate if one considers the increasing need for European countries to open their documentation sources to each other. The fact that the problems caused by the crisis in education differ very little from one country to another is clearly an incentive to go beyond purely national considerations, and the language which any one country uses for processing its information will not be fully effective unless it enables this transition to be made. It will then be not so much a documentation language for national convenience as an instrument of liaison between those centres in Council of Europe member countries which are at present using computer techniques to process their educational information, or are planning to do so in the near future. Once there is general agreement on methods, the language can be used in the preparation of abstracts for all computer retrieval purposes; it should then be possible, by exchanging magnetic tapes, to consult the various national sources; the actual documents could be supplied on request in the form of microphotographic reproductions.

The language has, therefore two duties to perform, equally important if one assumes that the demand for information in Europe extends beyond the frontiers of individual countries. In the first place it must be a vehicle for information of national interest, and for this it must both satisfy specific local needs and simplify internal exchanges; secondly, it must be amenable to external exchanges of information at European level, encompassing the entire field of the educational sciences, even though it may be required to establish the occasional link with national teaching systems so as not to overlook their distinguishing features.

2.3 A third duty should, however, be added to the two already mentioned, now that it is known to what extent the need for information goes beyond the limits of Europe in the countries involved in the EUDISED project. Many European documentation systems collect their material from other parts of the world. In France, for example, the Centre de Documentation Sciences Humaines of the CNRS, in Section 520 of its *Bulletin signalétique* which deals with educational sciences (Volume 24, No. 1, 1970), cites articles in 197 journals, 67 of which are not published in Europe, even in the widest sense of the term, i.e. including the USSR; of these 67 journals, 49 are published in the USA. In the Kungl. Tekniska Hogskolans Bibliotek in Sweden, where magnetic tapes of the American ERIC system are processed, the demand for studies produced in the USA is on the increase. Further examples could be given to show that a

European documentation and information system for education cannot be conceived as an inward-looking system without leaving a considerable proportion of user demand unsatisfied. This being so, it seems necessary to develop EUDISED in at least two main directions; that of the ERIC system used in the USA, and that of the system governing the programme of the International Bureau of Education, which aims to set up a world-wide network for the dissemination of information connected with educational development. The function of the language required for EUDISED will then not be confined to exchanges of information within each European country or even within Europe as a whole; it will also be to provide a link (of a type not yet defined), with the system used across the Atlantic and to prepare for the dissemination of information produced in Europe in the very wide framework of UNESCO/IBE.

2.4 It is scarcely necessary to mention its purely technical function, directly associated with the use of computer techniques in documentation, since it was decided from the start to base the proposed system on "advanced projects", which presuppose the use of such techniques. However, it would be as well to mention three requirements which the EUDISED language must satisfy, as they will very largely determine its characteristics:

2.4.1 The first requirement is that it should enable a fairly large number of documents to be processed. Where regular production is concerned, it would seem that the number of texts to be identified and analysed each year in a country such as France would be somewhere between 4,000 and 5,000 if, besides the studies published in scientific journals, one takes into account books, reports, teaching aids, research projects, conference papers, etc. In 1970 alone, the section of the *Bulletin signalétique* of the CNRS on educational sciences lists approximately 1,000 studies published in France, and these are articles from journals only. Naturally once the system is set up, this regular production will no longer be adequate; for much research it will be necessary to refer more and more to works produced in past years in so far as they contain information that is usable at the present time. Provision will therefore have to be made for the processing of some 20,000 documents in all for the whole of EUDISED. This figure is similar to the corresponding one in the ERIC system: the monthly publication *Research in Education*, which deals only with reports*, analyses roughly 10,000 documents a year.

2.4.2 Secondly, the EUDISED language must make for rapid processing. This requirement derives from the first, assuming that the intention is to process all information produced without too large a staff. And it is still more imperative if information is to be disseminated in accordance with user profiles since users always wish to know what the available documents are within a very short time of publication, and generally prefer rapid summaries to detailed analyses.

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* Articles published in the USA or elsewhere are mentioned in the *Current Index to Journals in Education* (18,000 articles in 1970 from some 500 journals).

2.4.3 The third requirement, which derives from this latter consideration, is that the EUDISED language must have as its main purpose the retrieval of documents. If a documentation service tries to provide substitutes for the documents processed in the form of mediocre abstracts, which would at a stretch dispense with the need to consult the originals, it is doomed to failure. The role of a language of analysis is not so much to *express* as to *indicate* the content of a document. In this respect, the language must take as much account of the document whose information it conveys as of the user whose requirements have to be satisfied. As its primary role is to match supply with demand, the language can hardly be fashioned with reference to the literature alone. But in making this assertion, we are already touching on the question of implementation, and before doing so it is necessary to examine the major options which determine both the nature and the main characteristics of the language, and are imperative in view of the functions of that language.

3. NATURE AND CHARACTERISTICS OF THE LANGUAGE OF ANALYSIS

We shall avoid discussion theories as far as possible and stick to simple, practical considerations: now that we know what is expected of the language to be used in the European information system for education, how is it to be conceived?

3.1 *Classification or list of descriptors?*

It is clear that a classification, however well done, is not what is needed. The requirements to be satisfied are not those of the library or bibliographic service, and it is less important to allocate documents to a wide variety of headings than to identify the information they contain by means of a complex set of indicators. Any classification plan that is in any way capable of coping with all the information comes up against a technical difficulty: either the categories which it sets out are broad, in which case the documents fit into them easily but much information is lost; or the categories are narrow, in which case the information may be specified in detail, but the documents themselves no longer fit, and so have to be either quoted under each heading or repeatedly cross-referenced under several headings; for that reason the classification is normally accompanied by a subject catalogue or an index.

A further disadvantage of a classification is that it is a rigid structure devised, in many cases, to comply with some underlying theory, and the great risk in sectors associated with the human sciences is that knowledge will petrify or that the search for it be pursued from the wrong direction.

For that reason the EUDISED language must be one not of classification, but of indexing. In the system it is less important to classify information than to put it on display ready for action; this requires the use of descriptors or keywords rather than of headings.

True, these descriptors will later form groups and the language will sort itself out into areas of meaning or become structured to meet the demands of analysts or users, so that the arrangement finally arrived at will

resemble that of a classification: but one should not be misled by this; there is a vast difference between a graded class framework and units of meaning which may be related in some way or simply juxtaposed. The important thing is to avoid starting with a rigid framework, and not to subject the field of study to any pre-conceived plan but to match the analysis to the document, the content of which should be allowed to express itself freely with the aid of the most appropriate descriptors. Only if the language is used in this way, as a flexible precision instrument, and constantly checked for compliance with the subject it covers, can there be any guarantee that the most useful information will be identified or that the fullest use will be made of the advantages offered by computer techniques.

Even though the aims of EUDISED demand that preference be given to a language of keywords, there are of course no grounds for condemning the classifications widely used today in the educational sciences; for example, the London Education Classification developed by D.J. Foskett of the Institute of Education, University of London, has been well tried since 1964; only the objectives are different.

From a strictly methodological point of view, this difference should be given careful consideration in the actual process of construction of the language. One could, for instance, consider constructing a kind of "thesaurofacet" on the model developed by J. Aitchison for the English Electric Company*. Attractive as it is, this model cannot be adopted unless it is agreed from the start not to force the area of knowledge into an arbitrary structure from which to derive the elements of the language, as it were, by deduction. And it is clearly more dangerous still for a service whose function is to provide current information on research to start with a classification plan, when the field it covers is part of an area - the human sciences - so susceptible to fundamental challenge and conflicting theoretical interpretation.

3.2 *List of descriptors or thesaurus?*

So obvious are the disadvantages of starting with a fixed structure, that it is legitimate to wonder whether any structure can ever be acceptable, even if it is formulated from the meanings of the terms that make up a fully constructed language and respects their affinities. In other words, would not a simple list of descriptors suffice, with alphabetical order as the only rule for arrangement?

Considering the functions of the documentation language used in EUDISED, the answer is quite clear: the language must take the form of a thesaurus. The principal reason for this is that, in a language which is by definition a common language, there must be room for descriptors expressing the widely differing characteristics of the teaching systems. If these descriptors are not attached to generic terms capable of bridging the gap between one system and another, considerable confusion is likely to arise, especially as identical terms very often have quite different meanings. Furthermore, on

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* Aitchison, J. "The thesaurofacet: a multipurpose retrieval language tool", *Journal of Documentation*, 26 (3) September 1970: 187-203.

the basis of the elements of the language and the meaning each is intended to convey, a number of semantic fields must be established for the purpose of clarifying that meaning; this is essential if one wishes to counteract the ambiguity always inherent in the terminology of the human sciences and to provide analysts with a reliable instrument. In addition, it must be possible with any information retrieval system (and EUDISED is just such a system) to pass from the generic to the specific, or vice versa, according to whether too much or too little information is obtained; it must also be possible, especially when the system is applied to research projects, to move laterally and gradually extend the field of inquiry, even if for no other purpose than to provide substance for fresh working hypotheses; these requirements are met only if the language is organised as a thesaurus, because such an arrangement makes these to-and-fro movements possible and makes advance provision for those byways through which new questions can be formulated. Finally, the fact that EUDISED must operate in a manner compatible with other systems, such as ERIC or the system developed by the United Nations and OECD in the field of economic and social development, is in itself sufficient justification for compiling a thesaurus. How can systems be made compatible if their languages are of widely differing types? Harmonisation cannot be founded on words, and any attempt to bring the descriptors of an organised list into concordance with the keywords of a thesaurus on the basis of their form alone, will achieve nothing. Reduced to an utterance and removed from its context, a keyword loses much of its sense and may well become one of those all-purpose terms that cannot readily be related to others. The descriptors in the list, on the other hand, break down into a multitude of meanings as soon as one attempts to equate them with the elements of a thesaurus, for, unlike those elements, they have no network of relationships to give them precise definition, and so fit in one place as readily as in another; any such arrangement will only produce nonsense.

Thus the decision to compile a thesaurus derives primarily from the role which the documentation language is required to fulfil within EUDISED; however, it may be some time before the plan materialises. A complete thesaurus is an end-product, and where EUDISED is concerned it will have to be delayed for as long as it takes to integrate a wide variety of national viewpoints into a single descriptive network and bring specific local problems into perspective. The fact that the European teaching systems are described differently in the various languages raises the problem of multilingualism. Should the EUDISED thesaurus, to fulfil its function satisfactorily, be multilingual?

3.3 *A multilingual thesaurus?*

The question is certainly difficult to settle, and it must be borne in mind that an immediate affirmative answer would virtually condemn the scheme to failure by placing too many obstacles in its path.

There is, however, no doubt that to compile a thesaurus in several languages is in itself the best solution and the only one really capable of reconciling the need to have documents processed at national level with the demand for interchange of information between one country and another; no other solution places the documentation language in such a good position for fulfilling the functions assigned to it.

This is not merely a political question, although the desire of each nation to maintain its cultural influence cannot, of course, be disregarded: the systems at present in operation in the EUDISED countries are all based on the use of the national language; foreign languages are sometimes used, but only to the extent necessary for processing magnetic tapes used in different language areas.

If the principle were adopted of a single language for EUDISED, to act as a common denominator for the purposes of documentation, most countries would have to process the information twice in order to meet the demands of their users. This would involve much extra work both in the export of home produced information and in the reception of information from other countries; it would also require a means to be found of putting across in the carrier language concepts peculiar to the national educational system, together with its related problems, unless it were decided to set apart documents for external use; finally, experience shows that where abstracts are prepared in two languages, one of them soon predominates, while the second acts as a language of translation, or is used only for indexing, thus losing its ability to express the content of the document in an original and genuinely accurate manner.

If one considers each country's needs, its achievements to date and plans for the future, then it seems, from a purely practical point of view, that a documentation system based on the use of more than one language is to be preferred.

The fact of course remains that it would be much more convenient to use one language only, one argument being that even within the Commission of the European Communities the system employed by the Centre for Information and Documentation on Nuclear Energy is based exclusively on English.

Such an objection is not, however, entirely admissible, since the above-mentioned service does not undertake to prepare abstracts directly, but only to track down documents on request, using abstracts prepared elsewhere and borrowed descriptors. The system that the Council of Europe is considering will be more integrated in so far as it is to be used for analysis, storage and retrieval. Since it will take abstracts prepared, for convenience, in various languages, it is logical that the storage and retrieval of information should involve the use of a multilingual thesaurus. In the CID system, on the other hand, the abstracting operations (also carried out in various languages) are quite separate from those of storage and retrieval. At the point of separation there is the indexing operation based on the EURATOM English-language thesaurus. This is in effect a form of double processing and the two-stage operation does not appear any less costly; it would be avoided if a multilingual thesaurus were used for both analysis and retrieval.

It should be noted that the secondary material processed by means of the EURATOM thesaurus raises no major problems, since that is a field where the vocabulary is stable and where the abstract and index terms generally correspond. One could hardly expect the same to be true if a EUDISED thesaurus compiled only in English (or French or German) were to be applied to abstracts drafted in other languages, and mostly on subjects treated from a specifically national standpoint. In fields as unpredictable as the

educational sciences, which have not been thoroughly conceptualised, and where there are no equivalence tables of the kind only a multilingual thesaurus can offer, the accuracy of the indexed references is bound to be questionable. And even if that were no problem, it would still be necessary to set up a central institution of the type that exists in Luxembourg, to conduct operations. EUDISED, however, was conceived from the outset as a decentralised network.

It is therefore necessary to refer to other models, and there is today no shortage of documentation systems which use multilingual thesauri. For example, in the transport sector (transport economics and road safety) the European Conference of Ministers of Transport and the International Road Research Documentation both have systems in which English, German and French are all used. Similarly, thesauri or lists of descriptors have been compiled in French and English for various international organisations, such as UNESCO, UNIDO and UNCTAD. But the striking example is without doubt that of the International Documentation Network for economic and social development made up of specialised United Nations agencies (ILO, FAO, UNESCO, etc.) together with OECD and a number of regional and national organisations. Since 1969 this network has been making use of an *Aligned List of Descriptors* in three languages (English, French and German); by 1972, after a complete overhaul and the addition of Spanish and Portuguese, this list of descriptors will have been converted into a five language macro-thesaurus.

Although some minor problems will naturally arise, the above precedents show that there are no major obstacles to the preparation of a multilingual thesaurus. This is in fact the conclusion drawn by B.V. Tell, R. Larsson and R. Lindh in their study entitled *Information retrieval with the ABACUS program; an experiment in compatibility*, published in Vienna in 1970 by the International Atomic Energy Agency. They describe the ABACUS program, which they apply to ERIC tapes among others, and add: "An automated system such as ABACUS should in the broadest sense be capable of processing any language. We are also processing French and German as well, since, as mentioned above, we are covering by our own input hundreds of journals in these languages. The English written profiles are given French and German equivalents which are matched against the free text of titles, etc., thus overcoming the language barrier without the delay of translation". The ABACUS program and the way in which it is used at the Royal Institute of Technology in Stockholm will be discussed later; for the time being we shall examine only its position with regard to multilingualism.

If this position is adopted, and if the quest for linguistic equivalents is carried out with sufficient success in the preparation of a multilingual thesaurus, the EUDISED language will truly fulfil its function. It will enable nationals of any country to analyse, store and retrieve their documents using their own language. They will also be able to use their own language to search collections built up elsewhere on magnetic tape and supplied in exchange for their own. The output they receive will naturally include the titles of foreign-language documents, accompanied by abstracts in the language of the document; and yet they will be able to grasp the essential content, even if they do not know the language, by looking up the descriptors in the thesaurus and finding the equivalents in their own language. If they consider that the documents are of interest, they will then be free to purchase them and have them translated.

3.4 *Thesaurus at input or output?*

The ABACUS program mentioned above is a system for processing documents directly: the actual language of the document is used, whether it be the title, an abstract, or a few significant lines from the text. The search function is based on the use of profiles which are established during interviews with the system's users, and are then amended or enlarged little by little; the profiles are printed in natural language, the material being provided either by the terms of the interview or by the documents, titles or abstracts sent to the enquirer for the purpose of clarifying his interests. Correspondence between document processing and the search function is established gradually; the profiles are tested in relation to the material received when retrieval takes place, and document evaluation takes increasing account of the users' fields of interest. A record is kept both of the profiles and of the responses, and this reveals what may in time be considered as the equivalent of a thesaurus. The method is simple. According to the sponsors, the percentage of satisfactory responses in the technological field in which it is applied has been above average; this is shown by a table in which the 36,072 references delivered in 1968-1969 are broken down according to user interest ratings:

Interest ratings from users

	References	*Percentages*
1. Of immediate interest	9 080	25.1
2. Of interest, but not for immediate use	11 009	30.6
3. Of interest, I have already read it	2 459	6.8
4. Cannot determine interest because the citation does not provide enough detail	1 306	3.6
5. Of no interest, because material does not correspond to what I have described to the system	11 913	33.0
6. Of no interest, because my interests have changed since I described them to the system	305	0.9
	36 072	100.0

ABACUS confronts EUDISED indirectly with a fundamental question: is it really necessary to have a thesaurus at the input? Is it not enough to allow it gradually to build itself up at the output?

On a theoretical level this question, although continually debated, is not very meaningful. It can be answered with opposing arguments, each equally valid: EURATOM possesses a thesaurus at the input, and ABACUS does not; and yet the two services have a number of features in common. It is entirely a question of convenience and of ability to meet demand.

The principle of decentralisation on which EUDISED is to operate makes it vital to have a thesaurus at the input if it is to be given a chance, from

the start, of co-ordinating the various national systems. Compiling such a thesaurus is not a time-wasting occupation, it will actually save time. For whatever system is used, the machine cannot perform miracles, and any work spared at the input by omitting the preliminary of language will have to be done at the output, unless the user is to be served up with a mass of material which he will be unable to use. By instituting the documentation language at the input, we will be giving the information rails to run on; the danger of losing it at the output is certainly less great than it would be if the information had been allowed to wander about at will (the so-called "natural" language encourages such wandering) and we shall no doubt stand a better chance of recovering it in an international network where many different languages are spoken and where terminology is unstable.

This does not, of course, mean that the thesaurus should be allowed to petrify. We can learn much in this connection from the experience of the Royal Institute of Technology in Stockholm, and still more where the preparation of a documentation language is concerned. Although not used, the natural language must be referred to, and the descriptors must be chosen with the documents in mind. It is also necessary - and this is certainly the most important lesson for EUDISED - that in the actual constitution of the thesaurus the greatest attention must be paid to future user requirements; for as the thesaurus is essentially designed for retrieval, it follows that it must be compiled by reference to user interest profiles and embody them as far as possible. In its subsequent development the language will retain this double reference; its role will always be to match supply with demand and to avoid any loss of useful information in the interchange process.

4. REFERENCE TO ESTABLISHED LANGUAGES

If these are the characteristics of the EUDISED language as revealed by its functions, is there not a chance that they might be found elsewhere? and if so would it not be possible to make the system work by borrowing an existing instrument?

It is clear that no single instrument combines all the characteristics: in the educational sciences, there is at present no multilingual thesaurus which directly covers the fields of teaching problems and educational research in the member States of the Council of Europe.

On the other hand, we can reduce our demands, stick to a single language, consider education as part of a wider field or, alternatively, divide up the associated disciplines; if we then go beyond the features peculiar to European teaching systems, there are a number of documentation languages to which we may refer.

4.1 Very few of these take the form of a thesaurus, or even a simple list of descriptors. Among them, the only specifically education-oriented ones are (1) the *Thesaurus of ERIC Descriptors*, second edition, 1969, and (2) the *Information Retrieval Thesaurus of Education Terms* by Gordon C. Barhydt and Charles T. Schmidt, published at Cleveland in 1968. Others which cover wider fields are: (3) the *Aligned List of Descriptors* for economic and social development, published by OECD in 1969 and due to be replaced by a macro-thesaurus, and (4) the UNESCO *List of Descriptors*, intended for processing

the documents of that organisation; each of these deals in part, but only in part, with the educational sciences, and the subject is considered from the standpoint of cultural advancement and social development. Mention may also be made of two other thesauri since the particular disciplines they cover are to a certain extent concerned with education: (5) the *Thesaurus for Information Processing in Sociology* prepared for UNESCO by Jean Viet and at present in the press (Mouton, The Hague), and (6) the thesaurus used for drafting the *Language and Language Behaviour Abstracts* at the Centre for Research on Language and Language Behaviour of the University of Michigan; this last thesaurus deals with linguistics and language teaching.

Numbers 3, 4 and 5 come from international organisations; the others relate to national systems some of which have connections on an international scale (numbers 1 and 6). Three are in English only (1, 2 and 6); two are in English and French (4 and 5); only number 3 is published in three languages (English, French and German).

There are many more documentation languages for education which are as yet unorganised; these are normally of national interest and include simple indexing glossaries, lists of concepts or lists of keywords. Some deal with the educational sciences as a whole and others with a single sector or a single type of document, and all are in one language only. There is no point in giving a complete list, but by way of example we mention the following, published in France: the index of concepts of the *Bulletin signalétique* 520 of the CNRS, the list of descriptors of the Service d'Information et de Documentation pour la Formation des Adultes, and the keywords used by the Groupe d'Information Documentaire of the INRDP to identify the characteristics of teaching methods, etc.

Although none of these languages can be taken over *en bloc* by EUDISED, most of them are useful points of reference for the preparation of the multilingual thesaurus; and there are at least two (numbers 1 and 2) which must be studied very closely when considering the type and number of descriptors, the general arrangement of the glossary and its contents.

4.2 With regard to the *type of descriptors*, no major problem arises. The decision to compile a thesaurus implies the adoption of a pre-coordinated indexing method. The need for such a method is so generally recognised in the human sciences that it might seem unnecessary to stress it. True, it gives the vocabulary greater extension; on the other hand, it is a far more reliable instrument. A decentralised documentation and abstracting system such as EUDISED cannot, without risk of serious error, be based on the exclusive use of single-word terms. In most cases it is impossible to attach a precise meaning to these, and if their co-ordination is to be established only as the abstracts or the inquiries dictate, the language is likely to become unintelligible.

It is scarcely necessary to add that the descriptors (compound terms or single words) must be meaningful in themselves before being inserted in a network of relationships, and that most of them will for that reason be nouns. One might add that, for the purposes of document analysis*, it is

* This subject is dealt with elsewhere in this volume. See the study by G.K. Thompson.

preferable to use singular nouns unless the plural form alters the meaning. But these are conventional reminders, and are set out with many others in the introductions to the ERIC Thesaurus and the Barhydt and Schmidt Thesaurus, and it goes without saying that we must abide by them.

4.3 The question of the *number of descriptors* to include in the thesaurus is more difficult to settle for the moment. It depends very largely on the pre-coordinated (bound) terms. It is often tempting to have a large number of these so as to remain close to the natural language, but then the thesaurus is in danger of assuming unwieldy dimensions. It therefore seems advisable to keep to two rules laid down by Barhydt and Schmidt: "First, if a bound term is needed as part of a BT-NT hierarchy, it should be added to the thesaurus; second, if the compound term provides clearer meaning than a single word term expressing the same concepts, the bound term should be used" (page 7).

The total number of descriptors also depends on the synonyms included. The second edition of the ERIC thesaurus contains nearly two thousand synonyms out of a total of 6,251 descriptors. What is the limit?

To take only the clearly individual descriptors, ERIC contains 4,347 and Barhydt and Schmidt 2,353. This leaves quite a wide margin of judgment, and no doubt the critical point is between the two. It is probably necessary to remain within this range so as to avoid overtaxing the memorising abilities of the analysts or spreading the search over too wide an area. It would be interesting to study the usage frequency pattern of the ERIC descriptors, so that in time the proportion of wastage can be estimated. Any thesaurus suffers from inflation to some extent in the early stages, and EUDISED will certainly be no exception, especially as it must be related to national systems and pay due heed to the problems of development, if it is to co-operate with the system of the International Bureau of Education and the International Documentation Network of the United Nations and OECD. Two years' experience will be necessary before we can have a fair idea of the number of descriptors really needed; but we can already say for certain that there will not be more than three thousand.

4.4 With regard to the *arrangement of the thesaurus* there is no major reason for new departures other than those occasioned by the addition of further languages.

The general model followed by ERIC and by Barhydt and Schmidt is that of the *Thesaurus of Engineering and Scientific Terms* published in 1967 by the Engineers Joint Council (New York). It comprises four sections, the main one being the "Thesaurus of Terms", the other three, the "Permuted Index", "Subject Category Index" and "Hierarchical Index", which follow, serve in effect as an index to the first. The last of these four sections is abolished in the two thesauri on education, and each follows a different sequence:

B. and S.: 1. Alphabetical Array; 2. Faceted Array; 3. Permuted List of Descriptors.

ERIC : 1. Descriptor Group Display; 2. Thesaurus of ERIC Descriptors; 3. Rotated Descriptor Display.

The sequence adopted by ERIC is to be preferred; in the B. and S., arrangement in the same sequence can be obtained by moving the "Faceted Array" to position 1. This is a more convenient arrangement for highlighting the correlation between the various languages somewhere in the thesaurus rather than only in the computer. The linguistic equivalents cannot (especially if there are 3, 4 or 5 languages) appear in section 2, which is the thesaurus proper, without considerably overloading it; nor can they be set out in the permuted list without making it unintelligible. They must therefore appear in the breakdown of the descriptors by semantic field, group or facet. For this reason it is helpful to put this section first; it will then provide a link between various volumes of the EUDISED thesaurus each covering a separate language area.

To make the thesaurus generally easier to use, there should be one edition in each of the main languages spoken in the member States. Each edition should comprise the three above-mentioned sections: sections 2 and 3, which are the thesaurus proper and the permuted index, would be in one or other of those languages; only part 1 would combine them all. It would group the descriptors according to semantic field or facet and give all the linguistic equivalents. The following example shows how this could be done:

(English edition)

PROGRAMMED INSTRUCTION/ENSEIGNEMENT PROGRAMME/
PROGRAMMIERTER UNTERRICHT

(French edition)

ENSEIGNEMENT PROGRAMME/PROGRAMMIERTER UNTERRICHT/
PROGRAMMED INSTRUCTION

(German edition)

PROGRAMMIERTER UNTERRICHT/PROGRAMMED INSTRUCTION/
ENSEIGNEMENT PROGRAMME

Etc.

It would, of course, be possible to set out the first part in one language only and use a computer-based code for determining the linguistic equivalents. However, analysts and users are likely to derive more benefit from the system by having the equivalence table before their eyes: it defines the descriptors by implication and removes any apparent ambiguity by confirming the meaning to be attributed to them.

With regard to part 2, which introduces the descriptors in alphabetical order and explains their meanings and inter-relationships, the best plan is certainly to adopt the conventional arrangement used by ERIC, and to accept the abbreviations: SN (Scope Note), USE or UF (Use For), BT (Broader Term), NT (Narrower Term), and RT (Related Term); this system is so well known that there is scarcely any difficulty in retaining these abbreviations, irrespective of the language of the edition. But to avoid having too many RT entries, it might be permissible to include references to facets or groups of descriptors identified by their numbers in the structure set out in part 1;

this will require firmer structuration than in the ERIC vocabulary so that each descriptor may be regarded as being related (RT) to the others in the group to which it belongs.

It would also be useful in part 3 (permuted list) to indicate, opposite each descriptor, the number of the group to which it belongs. This would be an incentive to the analyst to pass from alphabetical order, a convenient but not very meaningful arrangement, to a type of order in which the descriptors assume their full meaning.

4.5 More than its form, the *content* of the EUDISED language requires that reference be made to the established languages. But reference does not mean total acceptance. Although some degree of conformity was inevitable with regard to the technique of the language or its presentation, with differences only of detail, it does not seem possible, where essentials are concerned, to take over *en bloc* and without amendment what is done elsewhere.

In the United Kingdom and France, several attempts have been made to use languages such as ERIC for processing documents produced in those countries; the same conclusions have been drawn every time. Facts and phenomena associated with teaching and educational research in Council of Europe member States cannot easily be expressed through languages developed without reference to those facts and originating from a different teaching system and a different culture. It clearly is not a good method to start with these languages, see how far they are applicable, and then make the necessary amendments and additions. However carefully one checks, something is bound to be wrong. The result of taking a piece off here and adding a patch there is a badly tailored garment that is not even certain to cover what it should. This is the greatest danger. Any documentary language refers to a certain aspect of real life and organises its contents coherently with regard to it. However hard one tries to adjust it to other data, the logic of the organisation always resists this adjustment, so much so that it is easy to misjudge the extent of the alterations necessary.

It is better to proceed in another way. The aim, after all, is not to extend a system such as ERIC to an area for which it was not designed, but to establish links with it and ensure sufficient compatibility for the interchange of information. Thus the proper procedure is not to put ERIC on trial or to waste in countless tests money which would be better spent on other things; instead, one should start by thinking in terms of EUDISED, take as a guide the conception of the educational sciences specific to that system, adhere as closely as possible to the actual situation in each country in order to satisfy user demand and then compile the language. Only when the language has found some kind of consistency will it be useful to compare it with existing languages and then, complying as closely as possible with these, to select the descriptors and set them out in faceted array.

It remains to explain how this consistency is to be achieved.

5. CONSTRUCTION OF THE EUDISED THESAURUS

This is a collective undertaking requiring the co-operation of a fairly large number of documentation services and one cannot hope to complete it overnight by a single effort of conc ntrated thought. Some time is required, even if only to secure the interest of future users without whose whole-hearted support the thesaurus will never get off the ground. If operations start in January 1972 as planned, it is reasonable to expect them to be finished at the end of the following year, by which time we should be in possession of the desired instrument in its printed form.

These operations will take place in several successive phases, each subject to certain requirements which it has been thought possible to specify.

5.1 The first of these requirements is certainly that the language should reflect the situation of educational practice and research in the various countries. The preparation of the thesaurus must therefore begin at national level.[9] In each member State the co-operation of all documentation services in any way concerned with the educational sciences must be secured, so that a list can very quickly be obtained of the descriptors that seem on first examination to be applicable to the processing of that country's literature.

Securing this co-operation will normally be the responsibility of the EUDISED National Committee or, if there is no such committee, any body sufficiently representative to assume that responsibility towards the Council of Europe.

The list of descriptors may at this stage be simply an alphabetical one amalgamating all the lists used to date by the various documentation centres for their own purposes, in so far as they are relevant to education. The list will, of course, be written in the language of the country concerned.

5.2 At the same time as compiling the language it will be necessary to try to formulate user profiles, in order to meet the second requirement (just as important as the first) which is that the needs of the clients should be satisfied. After deciding what the user categories are likely to be (teachers, administrators, research workers, etc.) and agreeing on the size of a fairly representative sample, interviews will be conducted during which the respondent may be offered some primary or secondary documents (bibliographies, abstracts, etc.) and asked to decide which descriptors are most relevant to his particular case.

The descriptors composing the user profiles will then be listed in alphabetical order together with the frequency of occurrence of each.

5.3 The next step, still at national level, will be to compare and then integrate the two lists thus obtained; it will also be necessary to vet the result, make additions, note the synonyms, remove any ambiguities and then begin to arrange the descriptors in groups according to meaning, taking account of the structure of the terminology used in the country concerned and of the fields of interest revealed by the user profiles.

To ensure the successful completion of this task, a supervisor will have to be appointed by the EUDISED National Committee or equivalent body as soon as the operations begin. These will spread over several months, until 30 June 1972; on that date the EUDISED Secretariat at the Council of Europe will receive the documentation instrument compiled by each country for its own purpose.

This instrument will still be a rather crude one and will not warrant the title of thesaurus, even at national level. It will comprise two parts: an alphabetical list of descriptors, and a list of the same descriptors broken down into a few dozen fairly wide fields (of the type found in ERIC), with any explanations that may seem necessary to clarify meaning. The purpose of these groups is to make it easier to compare the various national lists; they must also give some idea of the field which each country wishes to highlight. It will not be useful, and may even be harmful, for any country to take language structuration any further. Language structuration is a matter for the EUDISED thesaurus itself, which must then be constructed on the basis of the contributions supplied.

5.4 At this level the polyglot aspect is of prime importance. Moreover, solving the problem of linguistic equivalence is an excellent means of checking the various national lists and of ensuring that the EUDISED thesaurus covers them sufficiently.

Several situations may occur; these can easily be described by calling the English list E, the German list G and the French list F, etc. Starting with list E, we find:

a number x of E descriptors with equivalents in G and F,

a number y of E descriptors with equivalents in G, but not in F,

a number y' of E descriptors with equivalents in F, but not in G,

a number z of E descriptors with no equivalents anywhere.

The same situations of course arise if we start from list G or list F.

The descriptors which are x in number give no difficulty; it is generally agreed that they must all be included in the EUDISED thesaurus as they find expression in each of the languages used. They should be listed in a memorandum which will then be circulated in the member States for ratification.

The descriptors which are y (or y') in number are normally viewed favourably at this stage for inclusion in the thesaurus, since they were selected by two member States. The proper procedure is to put them on a list together with the equivalents found in the second language and to submit them to Germany, France or any other country within the third language area so that the missing equivalents can be found.

The descriptors which are z in number represent what is left over from each list when all have been compared, and are therefore to be treated more cautiously. They must be referred back to the National Committee. Bearing in mind that the thesaurus is to be common to several countries, the

Committee will decide whether those descriptors are of general interest or relate solely to particular local features. If they are of general interest, the list of descriptors will be sent to the other countries and equivalents requested. If the Committee decides that the descriptors relate to purely national characteristics only, and that it is pointless to search for equivalents, there are two extreme possibilities: the descriptors can be entered in the EUDISED thesaurus in one language only, or they can be excluded. Neither of these is really satisfactory, because either the thesaurus becomes overloaded or it ceases to satisfy national needs. The solution which lies between these two extremes is for the thesaurus to be arranged in the manner described in paragraph 4.4: part 1, common to all editions (English, French, German, etc.) to include only those descriptors with equivalents in the other languages; the purely national descriptors to be added in parts 2 and 3, each of which is in one language only. However, to enable information of national interest also to be exchanged between one country and another, the corresponding descriptors will be related to generic descriptors listed in part 1.

5.5 An adequate foundation for the EUDISED thesaurus might be provided by combining features of the lists produced in each country, if one did not also have to take account of languages produced elsewhere: the *ERIC Thesaurus*, the *Aligned List of Descriptors* for economic and social development, or the thesaurus of the International Bureau of Education. As a first step it will be necessary, in each particular subject, to check the similarities between the descriptors used in each case, and the compatibility of the rules for the use of synonyms, and then to make the necessary adjustments. Subsequently, it will have to be decided whether new descriptors capable of forming a link with fields not covered by EUDISED are to be included. Finally, when the stage is reached of structuring the thesaurus and establishing relationships between the descriptors, it will be vital to preserve compatibility as far as possible.

5.6 This phase in the construction of a documentation language is always the one giving the most difficulty. It will be conducted by referring to the groupings proposed in the national lists, to user profiles and to existing thesauri. The ideal solution, if it were possible, would be to take account also of a large number of demands made on the system and the processes by which they are satisfied. As there is to be no trial period, we shall have to be content with a prior analysis of the content of the language, and do our best to forecast its uses, knowing perfectly well that the thesaurus will have to be polished up after a period of time in order to be fully effective.

6. PRACTICAL CONCLUSIONS

Two conclusions can be drawn from the description of the operations necessary for the construction of the thesaurus:

6.1 The first is that, in a task such as this, no time-table can be really reliable. But considering the two-year period available for its completion, the following schedule seems reasonable as a guide:

- 1 January 1972 to 30 June 1972: operations described in paragraphs 5.1, 5.2 and 5.3;
- 1 July 1972 to 31 January 1973: paragraph 5.4;
- 1 February 1973 to 30 September 1973: paragraphs 5.5 and 5.6;
- 1 October 1973 to 31 December 1973: publication of the various volumes.

The uncertainty lies in the last quarter of 1973. If these three months have to be set aside for completion of the thesaurus, it will not be published until the beginning of 1974.

6.2 The second conclusion is that somebody must be found to co-ordinate all of these operations. It has been shown that a supervisor will be necessary in each country for the preparation of the national lists of descriptors; a similar function is even more important in the EUDISED Steering Group for the preparation of the thesaurus. The person appointed will be responsible for collating national lists, breaking down the descriptors and obtaining equivalents, checking for compliance with other languages, establishing the structuration of the thesaurus and supervising the preparation of the manuscripts for publication. The task is one of co-ordination and preparation and must be carried out in close co-operation with the Secretariat of the Steering Group.

If these operations are carried out successfully, the European Documentation and Information System for Education has a very good chance of being in satisfactory working order by the beginning of 1974, without being an inward-looking system. However, in the countries concerned, it would be wrong to expect EUDISED to be set up in its final form, ready to begin processing and disseminating information. The system will be vulnerable if, in its preparation, it is not based on the educational practice of individual countries. Being essentially designed to co-ordinate the efforts of the member States, it will be ineffectual unless those efforts are forthcoming.

PREPARATION OF A RANGE OF STANDARDS FOR EDUCATIONAL DOCUMENTATION

by

R E COWARD

The British National Bibliography

SUMMARY

The study contains a set of recommendations for the basic standards to be adopted by participants in an educational information network. Standards are divided into:

- Standards concerned with the logical structure of exchange records;

- Standards concerned with character sets and character representation;

- Standards concerned with the physical media of exchange.

Particular attention is given to the characteristics of the proposed network. An information network may be regarded primarily as a theoretical system, but in practical terms any such network must first develop from a desire for a co-operative exchange between institutions with existing incompatible systems. Such systems cannot be lightly tampered with or easily changed, and in questions of international exchange the reality of national characteristics must be given due weight. These considerations affect both the choice of standards, the level at which standardisation is appropriate and the point in time at which standards are implemented. In practice the first standards that should be adopted are those that cover the physical media of exchange and the logical structure of records being transmitted between systems. Interchange of information in machine readable form in the field of educational documentation is as yet in such a rudimentary stage of development that there are no major obstacles to the implementation of a set of standards.

Standards concerned with the presentation and content of educational records are, by contrast, difficult to formulate and extremely difficult to implement. It may be necessary to introduce the concept of 'core standards' that will provide a basic commonality between systems within the network.

1. THE CHARACTERISTICS OF THE NETWORK

1.1 *Introduction*

This study refers to the standards required to facilitate the physical exchange of data in machine readable form between systems. These specify:

- Record structure,

- Representations of character sets,

- Magnetic tape standards.

It must be stressed that the standards proposed refer only to the transmission of data between centres. Although there must necessarily be an interface between data held internally in each centre of the network and data being transmitted between centres, the standards of exchange are primarily intended to provide a common carrier in a network which necessarily contains a large number of incompatible systems. The degree of incompatibility in computer systems is frequently absolute - that is there is no way in which the data organised for one machine can be directly handled in another. This

incompatibility gap must be bridged if a network in which all institutions concerned with educational documentation is to be established.

A second reason for establishing a set of exchange standards is to create a situation in which individual institutions in a network will receive information from any other institutions in the network in a standard format. Thus each institution need only prepare one conversion program to convert incoming data to its own file structure. In a decentralised network in which a large number of institutions will carry a responsibility for the original creation of information which will pass through the network this is an essential requirement.

The third reason for establishing a set of exchange standards rather than a set of local processing standards is to create a buffer between existing systems and the network itself. Ultimately the existence of a network carrying an increasing amount of traffic will tend to have a profound effect on individual nodes of the network but during the early stages of development this effect must be minimised. The successful formation of a network in educational documentation will depend absolutely on co-operation between the fairly small numbers of advanced computerised information systems that already exist. Such systems, with heavy commitments in hardware and software, cannot be easily changed and must be totally free to participate in on-going national development programs. They must be insulated from network effects.

1.2 *Choice of standards and characteristics of the network*

A network can be defined by

(a) The nature, function and number of the nodes connected,

(b) The nature and amount of information handled,

(c) The direction of the flow of information,

(d) The type of communication facilities employed,

(e) The interaction with other networks.

Each of these features must be known before standards can be formulated. The previous studies (1, 2, 3, 4) produced by the Documentation Centre for Education in Europe provide a fairly complete analysis of the potential network, although the situation is far from static.

(a) *Nature, function and number of nodes connected*

The network is intended to link institutions concerned with educational documentation in member States of the Council for Cultural Co-operation. In 1967 there were more than 100 such institutions. This figure does not take into account the non-specialised institutions, particularly universities and national libraries, whose collections are of major importance in this field. The potential network is of considerable size and contains a number of important institutions with very extensive bibliographic activities outside this specialised field. In the report published in 1968 (ref. 1) particular reference is made to the fact that

the various functions of the educational documentation and information systems are performed by institutions which show marked differences in organisation, size and scope. In a final paragraph it is stated that 'These different solutions are so closely tied up with the national, educational and administrative pattern that it would not be realistic to aim at institutional uniformity as a goal'. This very realistic statement must be given due weight in the consideration of standards, which must imply some level of uniformity.

(b) *The nature and amount of information handled*

The documentation and information activities of these institutions are very wide ranging indeed. Examination of existing machine systems shows, as would be expected, a marked concentration on production of bibliographic services.

The network will, during the early stages of development, be primarily concerned with the transmission of information about educational documents, i.e. catalogue entries of monographs, reports and periodical articles. However, stores of multi-media records already exist and it is clear that any network must have a capacity to contain and transmit original information. Any standard must therefore be hospitable to many different forms of record and also to the exchange of primary material.

The amount of material involved is difficult to measure. At an early stage in its development the United States ERIC Project was receiving 35,000 documents in a year. The number of periodical articles on educational topics published per year is probably between 100,000 and 200,000. The educational data bank is potentially very large indeed and it is doubtful whether any existing operational indexing system provides adequate facilities for interrogation. Any standard must therefore be hospitable to a range of existing systems as well as future developments in indexing designed specifically for machine held data banks.

(c) *The direction of the flow of information*

The network will, during its early stages of development, be very imperfect. There will be a transmission of information from a few centres and in most cases institutions will only receive from a single source. At a later stage there will be a two way growth of traffic between important institutions and a certain amount of onward transmission. This is analagous to the stage at present reached in the international MARC network which covers monograph records. Records created by the Library of Congress are, for example, transmitted to the British National Bibliography for onward transmission to British libraries. Individual institutions do not yet exchange information directly. A considerable level of standardisation in data content is necessary before a fully developed network emerges. When this stage is reached data may be created at any centre and transmitted directly to any other centre. In practice several formal subnetworks will finally emerge. National boundaries will exist because a high level of standardisation in record content will first be achieved within a national system. Nevertheless, while recognising that national characteristics will exist and must be accommodated these will inevitably inhibit the free flow of information in the system. The network will also

contain specialised subnetworks characterised by areas of interest. These specialised networks will cross national boundaries and will probably need to develop their own particular characteristics. Any exchange standard must therefore be hospitable to

- an overlay of national characteristics,

- various levels of refinement.

(d) *The type of communication facilities employed*

The possible range of techniques available for transmission of information in the network is fairly wide. Punch cards, paper tape, magnetic tape, disc files, magnetic card files have all been used to store information for transmission. In the near future the direct transmission of data between computer systems will become a normal means of communication. However it is too early to attempt to establish standards for direct transmission systems. Equally it is too late to lay down standards for exchange in paper tape or punch card form. Apart from direct transmission, magnetic tape is accepted as the only practical medium by which data can be interchanged between computer based systems. Adequate standards already exist for the physical properties and methods for recording on magnetic tape.

This does not imply that exchange in other forms should not take place in the network. Such exchange would be determined by the institutions involved. It may however be possible to lay down some general rules. Direct transmission or transmission of data held on disc files should conform to the general record structure standards laid down in this document. For punched card or paper tape a totally different structure is required. If this type of exchange is necessary it is recommended that the general record tagging scheme adopted by the network be used and that information is transmitted as a stream of tagged fields.

(e) *The interaction with other networks*

Education is above all a speciality with constantly shifting boundaries. Its definition is elusive and at any time existing material regarded as outside the field of educational documentation may be shifted inside. Education is so pervasive that the amount of material existing outside the special network in the more general network is very large indeed. The retrospective conversion operation at present being carried through by the Library of Congress will itself provide a vast store of bibliographic records of direct interest to educational documentation networks. In due course the national libraries of the member States of the Council for Cultural Co-operation will convert their bibliographic files into machine readable form. These national libraries contain extremely important educational collections. There are increasing signs that the libraries will form the national centres of a world wide general bibliographic network. The standards to be adopted by this network are of direct and immediate concern to EUDISED partly because a major transfer of information will constantly take place between them but primarily because of the direct concern and degree of administrative control that most national governments exercise in the provision of library services

and educational services. In many member States the control is exercised through the same department of state. The two systems are therefore administratively very closely linked together. There would have to be compelling technical reasons why different standards should be adopted. There are no such reasons. It is imperative that the two networks adopt the same basic standard.

2. THE LOGICAL STRUCTURE OF THE EXCHANGE RECORD

2.1 The recommended standard exists as a draft ISO proposal. This draft was prepared at a meeting of ISO/TC 46/WG 4 held in Sweden in June 1970 and was circulated to member States in October 1970 as a draft standard *Bibliographic Interchange Format for Magnetic Tape* (ISO/TC 4 Secretariat-14) 38). The standard conforms, in all essential respects, to American and British standards. The standard has been adopted by the Library of Congress and the British National Bibliography.

2.2 *Special features of the exchange format standard*

This standard is deliberately designed to place no constraints on the content or organisation of records transmitted. It is therefore particularly suitable as a basic standard for communication within a network which contains a very wide variety of incompatible records.

The standard does not refer to any specific features such as the use of classification systems, descriptor systems, cataloguing codes. It is hospitable to any existing indexing system and has in addition the capacity to hold multiple systems (the BNB MARC implementation for example may carry five formal subject standards - Dewey Decimal Classification, Library of Congress Classification, Universal Decimal Classification, Library of Congress Subject Headings, and Subject Descriptor Strings). This flexibility is essential in a network with pronounced national characteristics. (There is no suggestion here that the provision of so much subject data is a virtue. It is an unfortunate and expensive necessity which underlines the urgent need for the EUDISED network to reach agreement on a single indexing system.)

The distinction that is carefully drawn between the record structure standard and the record content and field identification standards that are also necessary in the network system is both logical and practical. Agreement on a formal record structure for interchange involves no existing operational system. If no exchange systems (other than satellite systems) exist as yet within the network then the major problem of standardisation - that is the accommodation of existing systems - does not exist. The major drawback associated with standardisation in a rapidly developing area - that is the stifling of development - can also be discounted. The structure described in this format is so completely flexible that it cannot possibly inhibit development where it will take place - that is in the component institutions in the network.

2.3 There are two practical objections to the standard. The first is that there is a processing waste associated with the transfer in and out of the communications format at each end of an exchange operation. This is only true if the institutions are using the same machine and the same internal formats, the same data representation, the same tagging systems etc. In which case they

can be regarded as separate parts of the same institution involved in an internal transfer of data operation. There is no need to use the exchange mechanisms.

2.4 The second objection is not connected with the format in particular but with the character representation. The standard states that all data is held in character form. This is both wasteful in space and inconvenient in processing computation cannot be handled in this form. However any network that is developed in the next few years must co-exist with the fact that magnetic tape is almost the only fairly standardised component in the computer industry. In a world of 6 bit and 8 bit machines with unique repertoires of instructions for manipulation of data the use of character and only character representation for exchange purposes is a necessity.

3. BIBLIOGRAPHIC INTERCHANGE FORMAT FOR MAGNETIC TAPE

3.1 This recommendation describes a generalised structure which can be used to transmit between systems records describing all forms of material capable of bibliographic description. Although the recommendation is designed for magnetic tape its structure might be used for other data carriers of bibliographic description as well as related records such as authority files.

3.2 *Terms and definitions*

bibliographic record — a collection of fields, including a record label, a directory and bibliographic data describing one or more bibliographic units treated as one entity.

datafield — a variable length portion of the bibliographic record containing a particular category of data, following the directory and associated with one entry of the directory.

Note: A data field may contain one or more subfields.

directory — a table of entries giving the tag, length and location within the record of each datafield.

(subfield) identifier — a data element, one or more characters immediately preceding and identifying a subfield.

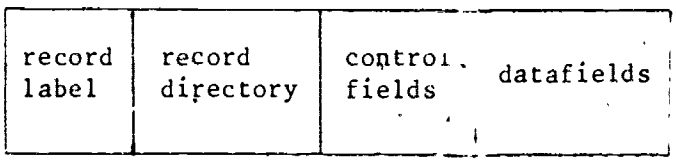
Note: Its first or only character must always be IS_1 of ISO/R 646 (7-bit code).

indicator — the first data element, if present, associated with a datafield supplying further information about the contents of the field, about the relationship between the field and other fields in the record, or about the action required in certain data manipulation processes.

record label — a field occurring at the beginning of each bibliographic record providing parameters for the processing of the record.

separating character	a control character used to separate and qualify units of data logically and in some cases hierarchically.
structure	an arrangement of the parts constituting a bibliographic record.
subfield	a part of a field containing a defined unit of information.
subrecord	a group of fields within a record which may be treated as an entity.
tag	a fixed number of character(s) associated with a field and used to identify it.

3.3 *Structure of communication format*



3.3.1 *Record label*

The record label is fixed in length for all records and contains 24 characters.

3.3.2 *Record directory*

The record directory is made up of a series of fixed length entries (12 characters each) which contain the identification tag, the length and starting character position in the record of each of the variable fields. The record directory will end with a field separator. The field separator shall be character IS_2 of the ISO/R 646 (7-bit code).

3.3.3 *Control fields*

Control fields are a special class of datafields. They do not contain indicators or identifiers.

Each control field will end with a field separator.

3.3.4 *Datafields*

Datafields are made up of variable length alphameric data. All fields end with a field separator.

The last field is followed by a record separator.

The record separator shall be character IS_3 of the ISO/R 646 (7-bit code).

3.4 *Structure and contents of record label*

Character positions	
0 - 4	Record length
5	Record status
6 - 9	Implementation codes
10	Indicator length
11	Identifier length
12 - 16	Base addr. of data
17 - 19	For user systems
20	Length of 'length of entry' field
21	Length of start charact. pos.
22 - 23	For future use

3.4.1 *Record length* (character positions 0-4) — the number of character positions in the record including the record label and the record separator. The length is a 5 digit decimal number justified right with zero fill if necessary.

3.4.2 *record status* (character position 5) — a single character, to be defined in an implementation recommendation, describing the status of a record, e.g. new, amended.

3.4.3 *implementation codes* (character position 6-9) — codes, to be defined in an implementation recommendation, describing e.g. record type (a book, a journal, an article, a map, a picture, etc.) and bibliographic level (analytical, monographic, serial, etc.)

3.4.4 *Indicator length* (character position 10) — one decimal digit giving the number of character positions of the indicators. If indicators are not used, the indicator length is set to zero.

3.4.5 *identifier length* (character position 11) — one decimal digit giving the number of character positions of the identifier, the first or only character of which must always be IS_1 of the ISO/R 646. If identifier is not used the identifier length is set to zero.

3.4.6 *base address of data* (character position 12-16) — 5 decimal digits justified right with zero fill if necessary, and equal to the combined length in characters of the record label, the directory and the field separator at the end of the directory.

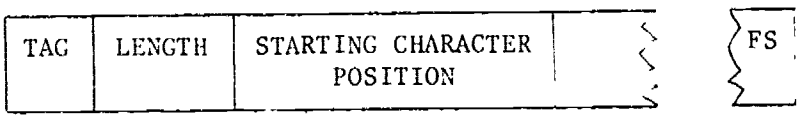
3.4.1 *Directory map*

(character position 20) one decimal digit equal to the length in characters of the 'length of field' part of each entry in the directory.

(character position 21) one decimal digit equal to the length in characters of the 'starting character position' part of each entry in the directory.

The arithmetic sum of these two decimal digits shall be 9.

3.5 *Structure and contents of record directory*



FS = Field separator

3.5.1 *Tag*

Three numeric characters which identify a control field or datafield.

3.5.2 *Length of field*

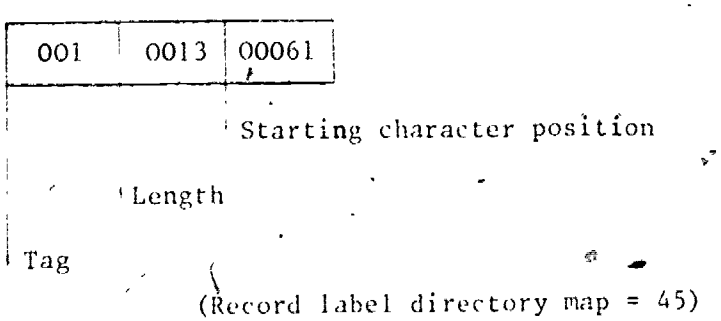
The number of characters in the field identified by the tag. This count includes indicators, identifiers, data and field separator. The number is right justified with zero fill.

3.5.3 *Starting character position*

A decimal number giving the position of the first character of the field identified by the preceding tag, relative to the base address of data (i.e. the starting character position of the first datafield following the directory is zero).

Subsequent record directory entries will have starting character positions incremented by the field length of the previous entry.

3.5.4 The combined length of the 'length of field' and 'starting character position' is 9 characters. The respective length of each part is stated in character positions 20 and 21 of the record label.



(Record label directory map = 45)

3.6 *Structure and contents of control fields (tags 001-009)*

DATA	FS

3.6.1 *Record identifier*

The first control fiel is a record identifier data field. The first directory entry (tag 001) refers to this field. The record identifier field must be present.

3.6.2 *Reserved datafield*

The remaining control fields are reserved datafields (tags 002-009). A reserved datafield supplies parameters which may be required for the processing of the bibliographic record. When, for bibliographic reasons, it is necessary to divide bibliographic records into subrecords, tag 002 shall be used for a subrecord directory constructed in the same way as the directory and referring to the directory.

3.7 *Structure and content of datafields*

Each field consists of indicators (optional), identifiers (optional) data and a field separator. The presence and length of the indicators or identifiers are determined by the indicator length and identifier length as defined in the record label and must be used consistently within each bibliographic field of the record.

3.7.1 Data field without indicators or identifiers

DATA	FS

3.7.2 Data field with indicators and without identifiers

INDICATOR(S)	DATA	FS

3.7.3 Data field with indicators and identifiers

INDICATOR(S)	IDENTIFIER(S)	DATA	IDENTIFIER(S)	DATA	FS

3A. IMPLEMENTATION FORMAT

The generalised record structure described in Part 3 is intended to provide a framework within which a local network implementation can be defined. Agreement should first be sought on the generalised structure before the specific network standard is considered.

The following is a recommended implementation standard for EUDISED.

3A.1 *Directory structure*

In the EUDISED network a directory entry will have the following structure

Tag: 3 numerics

Length of data field statement: 4 numerics

Length of starting character position statement: 5 numerics

3A.2 *Indicator positions*

In the EUDISED network each bibliographic datafield will begin with 2 character positions reserved for holding information about the field.

The meaning of the indicator positions is to be defined in a EUDISED implementation standard.

3A.3 *Subfield codes*

In the EUDISED network each bibliographic datafield will be divided into a set (one or more) of subfields. Each subfield will be preceded by and identified by 2 characters, the first of which must always be IS_1 of ISO/R 646 (7-bit code).

The meaning of the subfield codes is to be defined in a EUDISED implementation standard.

4. A STANDARD TECHNIQUE FOR HANDLING SUBRECORDS

4.1 The general standard refers to the organisation of records divided into subrecords (paragraph 3.6.2). No formal standard has yet been prepared for the actual handling of subrecords. The following is a description of the generalised techniques used by the British National Bibliography in the MARC II format.

4.2 *Subrecords*

In logical terms a subrecord is a group of fields within a record which may be regarded as an entity. In bibliographic terms a subrecord is normally an analytic entry describing say a particular paper in the report of a conference. An analytic entry may contain any field in the main record - classification, descriptors, authors, titles, abstracts etc.

Other forms of subrecord may occur depending on the final choice of cataloguing conventions within the network.

The capacity to hold subrecords is an essential feature of an educational documentation network. The ISO draft proposal contains general provisions for subrecords. The presence of subrecords results in the following form of directory structure.

MAIN RECORD DIRECTORY	SUBRECORD 1	SUBRECORD 2	SUBRECORD 3

4.3 In the general standard it is stated that tag 002 shall be used for a subrecord directory constructed in the same way as the directory and referring to the directory. In the BNB record this is interpreted in the following way:

Tag 002 (Directory entry)

Tag 002 is a standard directory entry. That is it refers to a field in the record. The presence of tag 002 indicates the existence of an unspecified number of subrecords in the bibliographic record. The *data* in tag 002 specifies the type of subrecords and the number of subrecords present. It further locates the address of the subrecord *directory* entries associated with each subrecord.

Tag 002 (Datafield)

The data in tag 002 consists of one or more fields each 12 characters in length. There is one such field for each subrecord.

The field contains 3 subfields:

(a) *Subrecord identifier* (3 characters)

One or more alpha characters indicating the nature of the subrecord. This is determined by the cataloguing conventions used. In the BNB/MARC format a subrecord is always an analytic record. One identifying code only is required. It is held in the form

A	ß	ß

(b) *Subrecord directory length* (4 characters)

The length statement refers to the length of the *directory* fields describing the subrecord. If for example there are three fields in the subrecord (author, title and subject) the subrecord directory will be 36 characters in length and the data in the second subfield of tag 002 data field will be

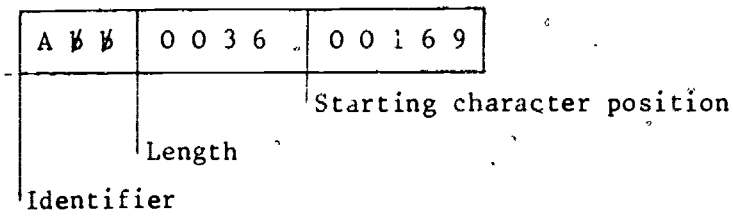
0	0	3	6

(c) *Subrecord directory starting character position*

The starting character position refers to the actual address in the record of the first character of the first tag of the subrecord directory entry, i.e.

0	0	1	6	9

A single datafield in tag 002 therefore has the structure



This is repeated for each subrecord.

5. CHARACTER REPRESENTATION

5.1 Computers operate most efficiently with small character sets. An educational documentation network requires a virtually unlimited character set. This is the basic dilemma facing bibliographic network systems. It can only be resolved by building a full character capacity into the interchange system even though most individual institutions in the system will tend to operate at a level which is more or less equivalent to the capacity of their local input/output devices.

At one extreme these will be 80 column cards and an upper case only line printer: at the other extreme there will be computer typesetting systems with floating accents, superscript and subscript characters and a range of non-roman alphabets. This is not a theoretical requirement. Major bibliographic networks are, as a matter of common observation, built around organisations with large publishing programmes (i.e. INSPEC, MARC, MEDLARS).

5.2 For internal processing the basic representation of a character is either in 6, 7 or 8 binary bits, giving 64, 128 or 256 unique characters respectively. A standard 7-bit character set for information processing interchange exists as an ISO and ASCII standard. The ISO code is identical with the ASCII code with the exception of a few symbols reserved for national use.

Above the 7-level code no formal international standard exists. IBM and some other computer manufacturers provide an 8-bit code *(extended binary coded decimal interchange code - EBCDIC)* but the general agreement on the ISO/ASCII 7-level code for information exchange will inevitably mean that extensions of the latter code will in due course be developed as general interchange standards. The general opinion is held that the ISO/ASCII 7-level code standard is as far as it will be possible to go in defining a universal basic character set. Beyond the point of 128 characters the character representation required in a network is determined by the special characteristics of the data being handled in the network. The bibliographic network community will therefore have to take responsibility for developing an 8-level representation and beyond that an 'escape' mechanism for representing a more extensive range of special symbols that can be provided by the 256 base. In addition a separate escape mechanism for representing non-roman alphabets is required.

5.3 These requirements have been recognised by the Library of Congress and BNB who have accepted the ISO/ASCII character values as a base line for future expansion. An 8-bit extension *(Library Character Set)* has been defined and is

in use, and special 'escape' mechanisms for further expansion are under consideration. It is recommended that the EUDISED network adopts the *Library Character Set*.

5.4 The special characteristic of the *Library Character Set* is that it leaves the 7-bit ASCII standard intact. The 7-bit code can be derived from the 8-bit code by removing the 8th bit. All characters with a zero in the 8th bit are part of the 7-bit ASCII standard which includes a full upper and lower case character set plus numerals and a range of punctuation symbols.

5.5 Although the adoption of an 8-bit basic code set is essential in a bibliographic network a large minority of the computer systems in the network will only be able to handle 6-bit character sets. A shift mechanism is therefore needed to make it possible to use all the characters defined in the 8-bit set in a 6-bit environment. It is recommended that the 6-bit code set is derived by removing the 6th and 8th bit from the 8-bit code set. The standard 6-bit set includes lower case alphas, numerals, punctuation marks and some special characters. Three characters in the 6-bit standard set are designated as non-locking shift codes. Two of these characters are utilised to indicate that the next character is either one of two non-standard 6-bit code sets.

5.6 The *Library Character Set* includes diacritical marks. These are always represented as separate characters and always precede the character to which they belong.

A limited number of diacritical marks are included in the 7-bit ASCII set. In order to simplify the handling of all diacritical marks these have been repeated in the 8-bit extension. No characters have been substituted in the standard 7-bit set.

6. THE *LIBRARY CHARACTER SET*

Decimal	Hexa-decimal	Binary	Graphic	Name and/or function
Ø	ØØ	0000 0000		Null
1	Ø1	0000 0001		Start of Heading
2	Ø2	0000 0010		Start of Text
3	Ø3	0000 0011		End of Text
4	Ø4	0000 0100		End of Transmission
5	Ø5	0000 0101		Enquiry
6	Ø6	0000 0110		Acknowledge
7	Ø7	0000 0111		Bell
8	Ø8	0000 1000		Backspace
9	Ø9	0000 1001		Horizontal Tabulation

Dec.	Hex.	Binary	Graphic	Name and/or function
1Ø	ØA	0000 1010		Line Feed
11	ØB	0000 1011		Vertical Tabulation
12	ØC	0000 1100		Form Feed
13	ØD	0000 1101		Carriage Return
14	ØE	0000 1110		Shift Out
15	ØF	0000 1111		Shift In
16	1Ø	0001 0000		Data Link Escape
17	11	0001 0001		Device Control 1
18	12	0001 0010		Device Control 2
19	13	0001 0011		Device Control 3
2Ø	14	0001 0100		Device Control 4
21	15	0001 0101		Negative Acknowledge
22	16	0001 0110		Synchronous Idle
23	17	0001 0111		End of Transmission Block
24	18	0001 1000		Cancel
25	19	0001 1001		End of Medium
26	1A	0001 1010		Substitute
27	1B	0001 1011		Escape
28	1C	0001 1100		End of File
29	1D	0001 1101		End of Record
3Ø	1E	0001 1110		Field Terminator
31	1F	0001 1111		Subfield identifier
32	2Ø	0010 0000		Space
33	21	0010 0001	!	Exclamation Point
34	22	0010 0010	"	Quotation Marks
35	23	0010 0011	#	Number Sign
36	24	0010 0100	$	Dollar Sign
37	25	0010 0101	%	Percent Sign
38	26	0010 0110	&	Ampersand
39	27	0010 0111	'	Apostrophe
4Ø	28	0010 1000	(	Opening Parentnesis
41	29	0010 1001	)	Closing Parenthesis
42	2A	0010 1010	*	Asterisk

Dec.	Hex.	Binary	Graphic	Name and/or function
43	2B	0010 1011	+	Plus
44	2C	0010 1100	,	Comma
45	2D	0010 1101	-	Hyphen (Minus)
46	2E	0010 1110	.	Period (Decimal Point)
47	2F	0010 1111	/	Slash
48	3Ø	0011 0000	Ø	
49	31	0011 0001	1	
5Ø	32	0011 0010	2	
51	33	0011 0011	3	
52	34	0011 0100	4	
53	35	0011 0101	5	
54	36	0011 0110	6	
55	37	0011 0111	7	
56	38	0011 1000	8	
57	39	0011 1001	9	
58	3A	0011 1010	:	Colon
59	3B	0011 1011	;	Semi-Colon
6Ø	3C	0011 1100	<	Less Than
61	3D	0011 1101	=	Equals
62	3E	0011 1110	>	Greater Than
63	3F	0011 1111	?	Question Mark
64	4Ø	0100 0000	@	Commercial At Sign
65	41	0100 0001	A	
66	42	0100 0010	B	
67	43	0100 0011	C	
68	44	0100 0100	D	
69	45	0100 0101	E	
7Ø	46	0100 0110	F	
71	47	0100 0111	G	
72	48	0100 1000	H	
73	49	0100 1001	I	
74	4A	0100 1010	J	
75	4B	0100 1011	K	

Dec.	Hex.	Binary	Graphic	Name and/or function
76	4C	0100 1100	L	
77	4D	0100 1101	M	
78	4E	0100 1110	N	
79	4F	0100 1111	O	
8Ø	5Ø	0101 0000	P	
81	51	0101 0001	Q	
82	52	0101 0010	R	
83	53	0101 0011	S	
84	54	0101 0100	T	
85	55	0101 0101	U	
86	56	0101 0110	V	
87	57	0101 0111	W	
88	58	0101 1000	X	
89	59	0101 1001	Y	
9Ø	5A	0101 1010	Z	
91	5B	0101 1011	[	Opening Bracket
92	5C	0101 1100	\	Reverse Slash
93	5D	0101 1101	]	Closing Bracket
94	5E	0101 1110		
95	5F	0101 1111		
96	6Ø	0110 0000		
97	61	0110 0001	a	
98	62	0110 0010	b	
99	63	0110 0011	c	
1ØØ	64	0110 0100	d	
1Ø1	65	0110 0101	e	
1Ø2	66	0110 0110	f	
1Ø3	67	0110 0111	g	
1Ø4	68	0110 1000	h	
1Ø5	69	0110 1001	i	
1Ø6	6A	0110 1010	j	
1Ø7	6B	0110 1011	k	
1Ø8	6C	0110 1100	l	

Dec.	Hex.	Binary	Graphic	Name and/or function
109	6D	0110 1101	m	
110	6E	0110 1110	n	
111	6F	0110 1111	o	
112	70	0111 0000	p	
113	71	0111 0001	q	
114	72	0111 0010	r	
115	73	0111 0011	s	
116	74	0111 0100	t	
117	75	0111 0101	u	
118	76	0111 0110	v	
119	77	0111 0111	w	
120	78	0111 1000	x	
121	79	0111 1001	y	
122	7A	0111 1010	z	
123	7B	0111 1011		
124	7C	0111 1100		
125	7D	0111 1101		
126	7E	0111 1110		
127	7F	0111 1111		Delete
128	80	1000 0000		
129	81	1000 0001		
130	82	1000 0010		
131	83	1000 0011		
132	84	1000 0100		
133	85	1000 0101		
134	86	1000 0110		
135	87	1000 0111		
136	88	1000 1000		
137	89	1000 1001		
138	8A	1000 1010		
139	8B	1000 1011		
140	8C	1000 1100		
141	8D	1000 1101		

Dec.	Hex.	Binary	Graphic	Name and/or function
142	8E	1000 1110		
143	8F	1000 1111		
144	90	1001 0000		
145	91	1001 0001		
146	92	1001 0010		
147	93	1001 0011		
148	94	1001 0100		
149	95	1001 0101		
150	96	1001 0110		
151	97	1001 0111		
152	98	1001 1000		
153	99	1001 1001		
154	9A	1001 1010		
155	9B	1001 1011		
156	9C	1001 1100		
157	9D	1001 1101		
158	9E	1001 1110		
159	9F	1001 1111		
160	A0	1010 0000		
161	A1	1010 0001	Ł	Polish L - Upper Case
162	A2	1010 0010	Ø	Scandinavian O With Slash
163	A3	1010 0011	Đ	D With Cross Bar - Upper Case
164	A4	1010 0100	Þ	Icelandic Thorn - Upper Case
165	A5	1010 0101	Æ	
166	A6	1010 0110	Œ	
167	A7	1010 0111	ʹ	Mʃagkiy Znak
168	A8	1010 1000	·	Dot in Middle of Line
169	A9	1010 1001	♭	Musical Flat
170	AA	1010 1010	®	Subscript Patent Mark
171	AB	1010 1011	±	Plus or Minus
172	AC	1010 1100	ơ	
173	AD	1010 1101	ư	
174	AE	1010 1110	ʾ	Alif

Dec.	Hex.	Binary	Graphic	Name and/or function
175	AF	1010 1111		
176	BØ	1011 0000	ʻ	ʻAyn
177	B1	1011 0001	ł	Polish l - Lower Case
178	B2	1011 0010	ø	Scandinavian o With Slash - Lower Case
179	B3	1011 0011	đ	D With Cross-Bar - Lower Case
18Ø	B4	1011 0100	þ	Icelandic Thorn - Lower Case
181	B5	1011 0101	æ	
182	B6	1011 0110	œ	
183	B7	1011 0111	″	Tvërdyĭ Znak
184	B8	1011 1000	ı	Turkish i - Lower Case
185	B9	1011 1001	£	British Pound
186	BA	1011 1010	ð	Eth
187	BB	1011 1011		
188	BC	1011 1100	ơ	
189	BD	1011 1101	ư	
19Ø	BE	1011 1110		
191	br	1011 1111		
192	CØ	1100 0000		
193	C1	1100 0001		
194	C2	1100 0010		
195	C3	1100 0011		
196	C4	1100 0100		
197	C5	1100 0101		
198	C6	1100 0110		
199	C7	1100 0111		
2ØØ	C8	1100 1000		
2Ø1	C9	1100 1001		
2Ø2	CA	1100 1010		
2Ø3	CB	1100 1011		
2Ø4	CC	1100 1100		
2Ø5	CD	1100 1101		
2Ø6	CE	1100 1110		
2Ø7	CF	1100 1111		

Dec.	Hex.	Binary	Graphic	Name and/or function
208	DØ	1101 0000		
209	D1	1101 0001		
210	D2	1101 0010		
211	D3	1101 0011		
212	D4	1101 0100		
213	D5	1101 0101		
214	D6	1101 0110		
215	D7	1101 0111		
216	D8	1101 1000		
217	D9	1101 1001		
218	DA	1101 1010		
219	DB	1101 1011		
220	DC	1101 1100		
221	DD	1101 1101		
222	DE	1101 1110		
223	DF	1101 1111		
224	EØ	1110 0000	?	Pseudo Question
225	E1	1110 0001	`	Grave
226	E2	1110 0010	´	Acute
227	E3	1110 0011	^	Circumflex
228	E4	1110 0100	~	Tilde
229	E5	1110 0101	¯	Macron
230	E6	1110 0110	˘	Breve
231	E7	1110 0111	˙	Superior Dot
232	E8	1110 1000	¨	Umlaut or Dieresis
233	E9	1110 1001	ˇ	Haček
234	EA	1110 1010	°	Circle or Angstrom
235	EB	1110 1011	⌒	Ligature
236	EC	1110 1100	⌒	Ligature
237	ED	1110 1101	'	High Comma Diacritical
238	EE	1110 1110	˝	Double Acute
239	EF	1110 1111	◡	Candrabindu
240	FØ	1111 0000	¸	Cedilla

Dec.	Hex.	Binary	Graphic	Name and/or function
241	F1	1111 0001	◟	Right Hook
242	F2	1111 0010	̣	Dot Below Character
243	F3	1111 0011	̣̣	Double Dot Below Character
244	F4	1111 0100	̥	Circle Below Character
245	F5	1111 0101	‗	Double Underscore
246	F6	1111 0110	_	Underscore
247	F7	1111 0111	̦	Left Hook \
248	F8	1111 1000	̧	Right Cedilla
249	F9	1111 1001	̱	Upadhmānīya
250	FA	1111 1010	͠	Double Tilde
251	FB	1111 1011	͡	Double Tilde
252	FC	1111 1100		
253	FD	1111 1101		
254	FE	1111 1110	’	High Comma (Centered)
255	FF	1111 1111		

7. EXPANDED CHARACTER SET (Greek, subscript and superscript)

(Extracted from *Books: a MARC format.* Information Systems Office, Library of Congress, 1970)

7.1 Although the present ASCII code configuration could accommodate some additional graphics, there are too few unused positions to provide enough codes for all future needs, i.e. complete character sets in Greek, Arabic and Hebrew etc. For this reason Greek, superscript and subscript characters have been placed in separate character sets. These sets will be indicated by locking escape sequences. Each escape sequence consists of the escape character ESC followed by a single lower case character. The following escape sequences will be used:

ESCs = Standard 8-bit set

ESCg = Greek set

ESCb = Subscript set

ESCp = Superscript set

All records begin in the standard set. When an escape is made to another character set all characters following the escape sequence will be interpreted as being part of the variant character set until another escape sequence is reached or the end of the record is reached.

7.2 *Greek*

The following Greek characters are preceded by the escape sequence ESCg. This is a locking escape and must be ended by the escape sequence ESCs in order to return to the standard set.

Decimal	*Hex*	*Binary*	*Graphic*	*Name*
97	61	0110 0001	α	Alpha
98	62	0110 0010	β	Beta
99	63	0110 0011	γ	Gamma

7.3 *Subscripts*

The following subscript characters are preceded by the escape sequence ESCb. This is a locking escape and must be ended by the escape sequence ESCs to return to the standard set.

Dec.	Hex.	Binary	Graphic	Name
48	30	0011 0000	₀	
49	31	0011 0001	₁	
50	32	0011 0010	₂	
51	33	0011 0011	₃	
52	34	0011 0100	₄	
53	35	0011 0101	₅	
54	36	0011 0110	₆	
55	37	0011 0111	₇	
56	38	0011 1000	₈	
57	39	0011 1001	₉	
40	28	0010 1000	(	Open Parenthesis
41	29	0010 1001	)	Closed Parenthesis
43	2B	0010 1011	+	Plus
45	2D	0010 1101	-	Minus

7.4 *Superscripts*

Superscript characters have the same values as the subscript character set above; however, the escape sequence to enter the superscript set is ESCp. To return the escape sequence is ESCs.

8. MAGNETIC TAPE STANDARDS

8.1 It has been recommended in the introductory section to this paper that magnetic tapes should be the only standard medium for interchange in the network. Situations may exist where other media are used (i.e. paper tape or disc) but these should not be regarded as official or subject to any standard other than those agreed by the participants.

8.2 Final recommendations on the magnetic tape standards cannot be made without knowledge of at least the major computer systems within the network. It will certainly be necessary to provide for alternative standards but these will significantly reduce the efficiency and flexibility of the network. Major systems will probably have the facility to provide tapes complying with a standard acceptable to nearly all minor systems but the latter may be totally unable to communicate directly with each other because their equipment is incompatible.

8.3 *Tape width*

Tape systems exist in various widths between $\frac{1}{4}$" and $1\frac{1}{4}$". It is recommended that the $\frac{1}{2}$" standard only be accepted.

8.4 *Number of tracks*

Two standards are widely used:

7 track (6 information bits and 1 parity bit)

9 track (8 information bits and 1 parity bit)

It is recommended that both these standards be accepted.

8.5 *Packing density*

The packing density is the number of code rows per inch recorded on the tape. Although variants occur the most widely used densities are 200, 556, and 800 rows per inch. It is recommended that two standards be accepted, i.e.

556 rpi tape for 7 track systems

800 rpi tape for 9 track systems

This recommendation is subject to further investigation of the computer systems in the network. In general the 200 rpi standard now looks extremely slow but it may be necessary to accommodate it. On the other hand the network may contain a large number of IBM system 360 tape units with a 1,600 rpi capacity.

8.6 *Maximum block length*

Block length is normally determined by the size of core storage available for input/output operations. Large I/O overheads are involved if the block length is uneconomically small. It is recommended that a maximum block length of 2048 characters is accepted and that records are unblocked. A standard block spanning technique for logical records of more than 2048 characters is necessary. This is under consideration by ISO.

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PROBLEMS OF STANDARDISATION IN THE RECORDING OF NON-BOOK MATERIAL

with special reference
to education media

by

J E LINFORD
The British National Bibliography

INTRODUCTION

In the United Kingdom there has been a certain amount of recent activity directed towards projects which share, in common with EUDISED, the desire to obtain more effective control over the recording of non-book material particularly in the field of education, as a necessary intermediate step towards promoting their more effective use.

A number of organisations exist in this field which act as cataloguing agencies for publication in particular media or which have special areas of interest and responsibility. However it is true that the overall picture remains one of incomplete coverage, varying standards of intellectual control and widely differing methods of organisation.

NCET/BNB feasibility study

The National Council for Educational Technology, which is jointly financed by the Department of Education and Science, Scottish Education Department and Ministry of Education for Northern Ireland, has been active in promoting a greater degree of co-ordination in this area and has set in motion a number of explorations, studies and committee activities which are directed towards this end. In 1970 the author of this paper on behalf of the British National Bibliography presented a brief report to the National Council for Educational Technology which sought to isolate the core problems to be faced in setting up a centralised computer store of non-book educational media to which the independent cataloguing agencies would contribute and from which they would draw the relevant records to produce their catalogues using computer formatting and typesetting techniques.

Such an exercise made the a priori assumption that a *standard record description* would be utilised to describe an item and that only a single basic description of any item would be held in the store, although the system would be designed to hold a number of unique annotations for any item since the viewpoint, special orientation and expertise used in evaluating an item may differ between the cataloguing agencies.

In addition, in this particular context, examination of existing catalogues showed a considerable variety in the grouping of sections into subject categories in the various publications. Rather than seeking to impose any standard subject descriptor system the report accepted that a number of unique subject descriptor fields could be held in the record to preserve any desired organisation of publication. To pursue this matter a little further, it was felt that the important level of compatibility in system terms would be achieved by ensuring that the data contained in a subject field in the record retained the sorting value required when handled by a standard sort program.

In the two contrasting samples below, although data content differs entirely in program terms, each group would produce the desired sequence of entries when this field were used to determine file sequence.

Dewey Decimal Classification	*Other Subject Section Organisation*
000 - General works	Section 1 - Higher education
100 - Philosophy psychology	Section 2 - Secondary education
200 - Religion	Section 3 - Primary education
300 - Social sciences	Section 4 - Reading
400 - Language	Section 5 - Mathematics
500 - Science	Section 6 - Science
600 - Technology	etc.
700 - Fine arts	
800 - Literature	
900 - History, Geography, Biography, Description and Travel	

The report then isolated the following problem:- "The largest single problem in system terms arises at this point since there is no unique identifier for each item which would provide a ready means of eliminating duplicate standard descriptor fields from the file.

This is a major problem since the same item may be input into the data bank from any or all of the agencies. There are a number of theoretical solutions possible here:

(i) The creation of a standard numbering system which would be applied by the producing agency;

(ii) The setting up of a single central handling agency with responsibility for the current listing and numbering of items;

(iii) The allocation of responsibility for current listing and numbering of particular types of media among existing agencies."

In the EUDISED Report of the Working Party on the Application of Computer Techniques to Educational Documentation and Information the concept of "... the division of labour among co-ordinated chains of specialised centres" (1) is mentioned (p.46 para 3.2). Such centres could operate on the basis of the patterns suggested in (iii) above.

In the analogous control area of bibliographic records for books the advantages of the International Standard Book Number as a unique control number within computer data-base systems are becoming more and more obvious. The single control number identifying a unique record in a computer-held data base allows the potential for selecting records for dissemination, simplifying union catalogue listing and interlending control, and simplifying and stream-lining order, acquisition and cataloguing procedures in an interactive mode with the central data base.

It is thought that it would be difficult to organise a standard item numbering system which is applied by the producers of items - as is done by publishers for book items - because of the diversity of producers and the lack of the more formal organisational grouping which exists in the book trade. However, this should not prevent agreement being sought with major producers for the application of item numbering at source.

The report envisaged the next major problem as that of establishing standards for the description of items stating that:

"Viable standards will be necessary at three levels:-

(i) For the description of each medium type e.g. films, filmloop, filmstrip, videotape etc.

(ii) For the choice and form of presentation of the elements of the descriptive entry of the item e.g. title, producing body, physical description, annotation, names of persons and corporate bodies associated with the item, etc., and

(iii) The definition of an agreed minimum set of data fields describing an item acceptable to each of the participating agencies."

The fourth main comment in the report related to the MARC format as a vehicle for carrying cataloguing records of non-book materials and is quoted below:-

"The MARC structure has a maximum of 999 descriptive fields, each capable of further break-down into subfields. Only a small proportion of available fields is used in handling bibliographical information. It can be asserted, therefore, that there are no inherent problems in creating a MARC compatible system for the description of non-book materials sharing a common pattern of item description for identical fields, which will also provide for any unique descriptor factors which relate either to media-type or to initiating agency."

The media data bank envisaged was

"... a collection of unique records resting on file:-

(i) Defined by type of media

(ii) Containing a standard set of descriptor fields, and

(iii) A number of unique agency fields.

The system would be designed to accept a single set of common data and any number of unique agency fields. Two major unique agency fields isolated on a preliminary examination of catalogues were

(i) The evaluative annotation provided by the agency, and

(ii) The 'subject descriptors' or headings used to display material in the printed agency catalogues."

On the basis of this report the National Council for Educational Technology decided to publish a pilot catalogue of non-book educational media using machine readable records coded in MARC format, adjusted in application, so that records could be manipulated to produce the formatted page output for a computer-typeset printed catalogue by utilisation of the programs existing at the British National Bibliography for creating a classified sequence of full entries, with supporting name and title index entries, and a separate subject index utilising the PRECIS indexing system (2). The HELPIS catalogue (3) - HELPIS is an acronym for Higher Education Learning Programme Information Service - established quite clearly the effectiveness of a multi-media catalogue produced from a machine-held data base, utilising the MARC format and programs for computer typesetting.

In the case of this exercise the data collection had already been planned before any decision to computerise the activity had been made. The original data collection sheet is shown as Appendix I. The planning proved particularly useful in the inclusion of details of Technical Information which was both explicitly listed in the physical description of each published entry of the HELPIS catalogue and also carried in the fixed field information code area of the machine readable record (MARC Format Field 008). Thus the machine-held file retains the potential of machine search on technical data characteristics. This is an extremely powerful facility in a wider database context for the production of single media listings and for the selective dissemination of records relating to particular combinations of characteristics.

Information from the original data collection sheets was transferred to a coded input sheet (example shown as Appendix Ia), subject information was added (the Dewey Decimal Classification number and verbal display feature and the index string), and this data was then punched onto paper tape. In order to meet system requirements a "pseudo - BNB number" was used as control number at input. This number was subsequently replaced as control number by the computer-allocated serial number which appears in the printed catalogue. It is worth noting in this context that the publication of a list with an associated serial number can itself be regarded as a means of establishing a quasi-standard item number, but for such an item marketing system to be effective a high degree of currency in the basic listing and wide dissemination to potential users would be required for it to operate effectively. The parallel of the LC card number is perhaps the best established example of such a system.

Plans are going forward for the production of a second edition of the HELPIS catalogue. A further form design exercise has been carried out which seeks to allow the original data collection sheet to be used also as a record input sheet (*cf.* Appendix Ib). Essentially this has meant the reorganisation of the sequence of information to match the requirements of field tagging and coding, but since the sequence of fields in the MARC format itself essentially patterns the requirements of a standard catalogue entry this has imposed no unacceptable constraints.

Library Association Media Cataloguing Rules Committee

Recognising that the cataloguing of educational materials in the various non-book media is becoming an increasingly significant factor in the effective development and utilisation of these media the National Council for Educational Technology sought the establishment of this Committee to establish standard cataloguing rules for non-book media.

The Committee will attempt to formulate a code of practice that will

(i) provide for the uniform description of media materials in terms which will both identify them and distinguish them from other similar material

(ii) facilitate the selection of materials in the various media for a single purpose, and

(iii) allow the interfiling of catalogue information on all kinds of media in a single file.

The Anglo American Cataloguing Rules (4) provide the basis of a unified code of rules for several media (i.e. films, sound recordings, pictures and prints). There is too the obvious advantages of developing a standard code for both book and non-book materials since there is little logic in creating the basis of a non-book materials catalogue which cannot include records of books as well. The ideal becomes an "omni-media" catalogue in which entries for books will rank alongside those for sound recordings, films etc.

With the work being carried out by a Committee of the Library Association there can be reasonable assurance of the probability that the results will be adopted as the standard within English-speaking countries and the hope that there will be growing international recognition of the rules, as has been the case for the rules covering books.

Summary of introductory section

This section shows the progression of activity towards the control of information about non-book media in the United Kingdom.

The NCET/BNB feasibility study isolates as the main problem areas:-

(i) The need for some standard item numbering system to be set up

(ii) The establishment of standards for the description of each media type; for the choice and form of presentation of the elements of description of an item; for an agreed minimum set of data fields.

It further suggested that the MARC format was a suitable vehicle for the interchange of such records, and that plans should allow for a considerable degree of flexibility in the field of annotation and of subject descriptors.

The HELPIS catalogue project proved the suitability of the MARC format for holding records of non-book material, demonstrated that standard programs developed for monograph handling could be used and further, utilised the

subject index creation program developed by the British National Bibliography to give specific rotated subject entries. The exercise also gave some experience in the organisation of data collection and in the design of forms to facilitate the direct keyboarding of data into the system.

The setting-up of the Library Association Media Cataloguing Rules Committee was a practical step to come to grips with the problem of the lack of a coherent body of rules covering the various non-book media.

This introduction has already isolated some of the fundamental problems of standardisation which must be faced and has shown the pragmatic approach to their solution adopted in the United Kingdom.

ANALYSIS OF THE PROBLEMS OF STANDARDISATION

Ideally standardisation will be achieved in the following areas:-

1. Standard item numbering
2. Standard medium designation
3. Standard data element listing
4. Standard data element presentation, form, punctuation
5. Standard data element citation
6. Standard subject descriptor system
7. Standard subject indexing control
8. Standard format coding
9. Standard information code control

Standard item numbering

In the United Kingdom the Standard Book Number system (5) has become practically 100% effective. Established publishers have their unique prefix and serially number each publication, while SBN's are allocated by a central agency for minor publications of more ephemeral publishers. This two-tier system ensures virtually complete coverage of any known work. Lying in the background to this is the high degree of control in the recording of information about published works established by both the book trade bibliography and the national bibliography operating in co-operation with the Copyright Agent, and thereby with access to works deposited under legal deposit provisions of the Copyright Act.

The NCET/BNB feasibility study recognised the problem of operating similar control for non-book educational media since so much of the production in this area derives from institutions which are not primarily producers, and therefore cannot be expected to possess the same degree of organisational control that is found in the book publishing world. Thus it seems unrealistic to expect that a parallel system of international standard item numbering allocated by the producer could expect to be as effective as the ISBN system. Nevertheless considerable gain would be achieved if even a proportion of media-producing agencies were able to apply standard numbering at source.

The NCET/BNB study suggested the alternatives of operating a numbering system either through a central handling agency, or by the allocation of responsibility for standard item numbering between agencies.

For such a second-level system to be effective the standard item number would have to be applied and disseminated to potential users very quickly since currency would be absolutely vital to the success of the scheme. This probably precludes the possibility of using the periodic issues of a published catalogue containing full record descriptions and subject analysis, since the delays inherent in cataloguing, classifying and publishing such catalogues operate a very heavy time penalty.

An alternative approach has been considered whereby each data collection agency notifies items briefly by title to a central numbering agency which would hold a full listing of titles as a machine-held file. New titles would be input to this file and matched against titles present. If no match was present a number would be allocated and the new item written-off to the current standard item number notification file. Matches would similarly be written-off to the file with an appropriate message indicating that the item was already on file, citing its standard item number. The resulting correct list of items would be communicated to all of the network and the number used as a record control number for all subsequent activity. It is possible that as the total file would never be very large, full cumulated versions of the file could be disseminated without difficulty. A suitable vehicle would be 16 mm microfilm output using COM (Computer Output Microfilm) production techniques. This mode of output has been adopted as the basic method for circulating bi-monthly updates of files of location by LASER - the London and South East Region of the national inter-lending system in the United Kingdom.

Standard medium designation

Cataloguing rules for non-book materials as a group (as distinct from rules for works in a single media) which have been examined (6,7,8,9,10,11) accept the need to identify the media on the catalogue entry in some way. They differ however in their listing of terms, in whether they use an abbreviation or code to represent the media, and in the placing of this information in an entry. At this point in the analysis of the problems, differing opinions on the placing of the medium designation will not be considered, since this is more appropriately considered under standard data element citation.

The comparison of medium descriptors listed in five multi-media codes (*cf.* Appendix I) demonstrates two of the problems in this area, namely:-

(i) the degree of specificity to be sought by primary medium descriptor, and

(ii) the need for standardisation in terminology.

Degree of specificity of medium designation

The problem of the degree of specificity to be used as medium designator can be exemplified if one considers microreproductions or microforms (the latter term is considered preferable since microreproductions are no longer necessarily a reproduction of something that has previously appeared in a readable visual form).

Riddle (6) specifically lists the following microforms - aperture card, microfiche, microfilm, micro-opaque. (It could be further argued that a microscope slide also belongs to the microform group although it is not conventionally included in such a grouping.)

Aperture card is defined by Riddle as:- "a card with an opening or openings within which microreproduction on film is mounted". Micro-reproduction is itself defined in a footnote as:- "a miniature reproduction of printed or other graphic matter which cannot be utilised without magnification, i.e. a microform". There are obviously very real problems in the adequacy of terminology.

To a large extent the problem of designation is one of relating a medium to a particular piece of equipment, rather than of stating the physical medium and characteristics of that physical medium. Both 16 mm microfilm and 16 mm film share the same physical medium and the characteristic of possessing an image which becomes visible when a light source is passed through it, but yet there is no suggestion that they should belong to a single category in any of the multi-media cataloguing rules, since essentially they need to be viewed by entirely different equipment. The definition of aperture card is quoted since it is an example which, it could be argued, belongs to either category of microfilm or microfiche, and yet equally needs to be designated as a separate category since its use is once again dependent upon special equipment.

It may be argued that the effectiveness of the medium designator to the potential user of a multi-media catalogue or listing depends on the accuracy of the inference he may draw about the equipment to be used to extract its information content, and that this in turn depends on the degree of standardisation which exists in a particular technical environment. Thus while users in the field recognise microfilm and microfiche as two different categories (superficially based on the need for different types of reading equipment), beyond this they will concede the need to state the film gauge 16 mm or 35 mm. By designating "16 mm microfilm" one is close to a standard, although there is no certainty that the microfilm can be read on a particular reader. The film itself may be filmed in either cine mode or comic mode and may be either on an open reel or in cassette. Further, the cassette itself may only be usable on the reader of a particular manufacturer.

The problem is thus a very real one. To cite "microform" as a descriptor seems to say too little, when the single word "microfiche" or "microfilm" carries a much more specific connotation. Yet it might be considered misleading to the user, while logically accurate, to describe a PCMI transparency with a reduction of 150:1 as a microfiche.

This situation is no doubt more aggravated in the newer fields such as electronic video recordings.

It will be suggested later in the paper under standard data element listing that one such data element contains the full physical description of the item. Thus the medium designator does not stand alone as the only part of the description of the item which links the item to equipment for its interpretation. The medium designator may be considered as an alerting signal to the user, enabling him to decide at an early point of time in his use of the record whether to check out the full physical description for equipment compatibility.

A further problem which needs consideration is the way in which combined media presentations should be described. Kit is a term which is used in the multi-media codes examined and is defined by Riddle (6) as "a combination of 2 or more media designed to be used as a unit". The Media Cataloguing Rules Committee discussed this problem and at an earlier point in their deliberations sought to distinguish between the idea of *kit* (as an assemblage of items which could be used in any order) and *set* (with the implication of a pre-determined sequence of use). In the case of the latter term it could quite clearly also be used in a single media context e.g. Transparency set. More recently the Committee have moved to the view that two-media presentations will be identified by name e.g. tape-slide and that the medium designator "multi-media" will be used for combinations of three or more media. These terms will be used in conjunction with a qualifying term. Qualifying terms proposed are *unit* and *pack*, with the following meanings -

Unit - for interdependent materials i.e. multiplicity of media combined with integration of use.

Pack - for multi-media presentations whose components may be used individually.

The problem area of medium designators is one which would benefit from the focus of attention of a working party. Three possible solutions suggest themselves:-

(i) To draw up a list of fully specific medium designators.

(ii) To use generic terms as medium designators and rely on the full detail carried in the physical description field for precise information. Or,

(iii) Draw up an agreed canonical list of medium designators which attempted to reflect the degree of acceptance of certain specific descriptors, while using generic terms for less standard items. This list should be open to admit new terms which would be added as new media were developed.

Standardisation of terminology for medium designators

The terms listed in Appendix II indicate the need for standardised terminology which is itself inlaid within the problem of the degree of specificity required in the medium designator.

The codes examined share the common language of English. This to an extent highlights the problem, since if North American terms are not acceptable in other English-speaking countries a far greater degree of diversity of terminology is likely to evince itself in countries with different languages.

In such circumstances the use of a code to represent the medium designator might well offer an effective compromise. The code could be used in a computer based system however to generate the equivalent descriptor term in any of the languages of the national groups if an explicit descriptor term were considered necessary.

The working party responsible for arriving at the list of medium designators should also produce a multi-lingual table of equivalences and consider the possibility of an international set of codes for medium designation.

Standard data element listing

In this area there already exists considerable consensus on the data elements which should be included in a standard citation of an item. Provision should be made for the following:-

	Names (personal or corporate) associated with the item
	Title
	Medium designator
"Imprint" area	Sponsor
	Producer
	Distributor
	Country of origin
	Date
"Collation" area	Physical description
	Number of items/sides/frames
	Length/running time
	Sound
	Colour
	Size (width, diameter or dimensions)
	Speed
	Form of print/recording
	Series

Notes area	(Credits (Contents/Summary (Notes

These elements may themselves be broken down into sub-elements. For example the title element is susceptible to breakdown into the following:-

Title/Sub-title/Extension of title/Attribution of authorship/

Part or volume numeration/Part or volume title.

Comparison between the elements listed in the Standard Bibliographic Description (Appendix III) and the elements isolated in the multi-media cataloguing rules examined shows that the rules do not make provision for two areas which should also be considered for inclusion in the standard data element listing. The first of these is item 2 of the SBD i.e. Edition area. This is at present an element not usually found in the description of non book media but it is thought that consideration should be given to its presence since there seems no logical reason why the concept should not occur. It seems very probable that a basic kit or slide sequence will be upgraded from time to time to produce an amended version of its information content, which would produce a directly analagous situation to the edition concept in relation to monograph literature. Similarly abridged versions of films occur frequently, presenting a direct parallel to the use of the edition statement presentation of abridged editions of monographic works.

The inclusion of the second area, which in the standard bibliographic description contains ISBN, binding and price, seems equally prudent. By analogy it would contain the standard item number, any information relating to variant physical presentation and the price.

It is generally accepted that the degree of annotation required for non book material is higher than for books since it is very often impossible to consult the material in a browsing manner and elicit the required information about content, intellectual level, and specialist orientation.

In the HELPIS Catalogue it was found helpful to differentiate the type of note carried more precisely. The differentiation arrived at provided separate notes covering:

(i) Summary of contents, with details of special production features.

(ii) Intended use.

(iii) Supplementary materials.

(iv) Restriction on use.

The latter category related both to external factors such as non-clearance of copyright material, or the need to obtain special clearance from a particular authority, and also to limitations on use posed by the need for special equipment.

Standard data element presentation, form, punctuation

It is recommended as far as possible the presentation of data in the entry for an item follows that prescribed in the Anglo-American Cataloguing Rules (4). In the United Kingdom the setting up of the Library Association Media Rules Committee is a step that will help ensure that this is the approach in this country. The creation of multi-media cataloguing rules should be considered as a step towards omni-media compatibility in the creation of a total information resource catalogue. There is little sense in attempting to legislate for new standards in this area since there are cogent reasons for building upon the well-established basis of the past. The Anglo-American Cataloguing Rules are themselves based upon the international principles arrived at in Paris at the International Conference on Cataloguing Principles held in 1961. A number of other national cataloguing codes are based on these principles, and at present German-speaking countries are working towards a codification incorporating them. The Anglo-American Cataloguing Rules represent the most detailed and consistently worked out application of the international principles in a published code.

It is suggested therefore that to provide the basis for international compatibility needed to establish the central data store of machine held records of non book media that elements present in an entry are cited in the appropriate mode of the AACR. This will govern both the form of name to be used for persons and corporate bodies and ensure that the cross reference structure for alternative forms of names is adequately provided for. Further, when the analysis of the standard data elements and sub-elements has been carried out standard punctuation equivalences should be given for both full catalogue entry requirements and for subsidiary entry situations.

This will allow punctuation to be program generated at output while data input is punctuation free at field and subfield boundaries. Since the selection, manipulation and display of the elements of the entry will differ in different modes of output e.g. card catalogues, printed lists and indexes, this allows the maximum degree of flexibility within the concept of overall standardisation. For the preparation of machine held data the degree of standardisation required is very high, covering for example the presentation of abbreviations since O.E.C.D. and O. E. C. D. are treated as entirely different data elements in any computer matching or sorting programs. Similarly exact standards for capitalisation will be required. The production of a data preparation manual should be considered to establish exact standards.

The Standard Bibliographic Description (12) has laid down punctuation conventions which aid the recognition of the part of the entry and thereby optimise the understanding of the data content of the record - particularly in multi-lingual situations. Consideration should be given to a similar convention to aid the comprehensibility of a multi-national bibliography of non-book media.

Standard data element citation

In dealing with Books the order of elements of a catalogue entry has been canonically established and has a considerable degree of universal acceptance. The order is essentially

Author

Title statement

Edition

Imprint

Collation

Series statement

Annotation

This order is reflected in the order of elements of the Standard Bibliographic Description (*cf.* Appendix III) except that the SBD makes no provision for author headings, while it makes special provision for the inclusion of the ISBN binding and price area in recognition of the current importance of this new field of bibliographical control.

That there is no such overall consensus in the field of non-book media is demonstrated in the analysis prepared by the Media Cataloguing Rules Committee of the Library Association presented as Appendix IV.

In dealing with non-book media there seem to be no overriding reasons for changing the overall sequence of fields from that already established for books. Indeed, it has already been suggested that in an omni-media context there are good reasons for maintaining parity between the two situations.

One further condition needs closer consideration in the non-book media situation. This is the placing in the entry of the medium designator which is inextricably linked with the problem of the degree of specificity used in the medium designator itself. Basically there are two opposing views on the placing of the medium designator. The first is that it should immediately follow the title statement of the item in order that the user will arrive as quickly as possible at the factor that will enable him to decide whether the medium is relevant to his enquiry or not. If he decides it is relevant he will pursue his reading of the entry to check out in the physical description area to decide whether it does in fact fully meet his requirements in terms of equipment compatibility and other physical characteristics e.g. whether a film is in black and white or colour, whether it is sound or silent.

The second view is that the medium designator is itself in fact a broad category of physical description and should immediately precede the full physical description to which it is inherently related.

The HELPIS catalogue used the second approach, although this choice was based on overriding external considerations. The catalogue was produced by using the MARC II format operating by programs prepared essentially for the production of entries for books. Nevertheless it can be used to assess the performance of the medium designator in this position, and, in the case of works in more than one medium it may be argued that the proximity of the descriptors to the more detailed physical description does allow for greater intelligibility of the entry.

It can also be argued that the views of those who require the medium designator to act as an early alert to the medium could be met by using typographical distinction. In a printed catalogue, for instance, the medium designator in bold type would visually stand out wherever placed in the entry and thus would not be so strongly dependent upon its juxtaposition with the title element to provide the information quickly. In a sense the problems of citation order need not be totally defined at the beginning of the exercise as long as the elements are indentified and coded at input, since any desirable citation order can be achieved by program intervention. Such consideration as the placing of the medium designator in the entry tend to be important if one is considering a single output mode, which conventionally is the card catalogue. It is perhaps more relevant in terms of recent technological advance to consider a catalogue on microfilm produced by COM (Computer Output Microfilm) as the most suitable mode for the communication of visually accessible information. If this is so the conventions of presentation usually associated with the presentation of the information on cards need to be reassessed.

The problem of citation order occurs at a second level in any field of the record which itself may be broken into sub-elements. In the example cited earlier, that of the title field, an order of context dependence is usually self evident and entirely acceptable. No one would suggest that sub-titles should take precedence over the title in citation order. In other areas no such context dependent order can be clearly established. For example, if one accepts the need of three separate statements for sponsor, producer and distributor for certain media, different citation orders can be justified for both the individual elements themselves and the further data which may be associated with each i.e. country, place, address and date.

These problems can probably best be solved by the informed consensus of the specialist agencies involved, since there appear to be no absolute philosophical criteria by which citation order can be decided.

Standard subject descriptor system

For an information network to operate efficiently a standard mode of subject description is desirable. Fundamentally the subject control should provide the facility for machine searching, allow the organisation of files by subject headings, and also provide the possibility of classified arrangement with retrieval via the subject index. Subject index control is dealt with in the next section.

The problem of deciding which classification scheme to use, or which system of subject headings to adopt, is essentially that of choice of an adequate system. The field of educational involvement is so wide that consideration of general subject schemes is imperative. Non-book media of relevance to educationalists will span the whole subject spectrum. This is demonstrated by the range of subject matter included in the HELPIS catalogue.

Existing schemes, however, tend to lack coherent overall development, and frequently display a lack of logical organisation. This is equally true of general classification schemes and lists of subject headings.

The British National Bibliography pursued a policy of specific subject analysis based upon classification for the period 1951-1970, which allowed more consistent and coherent subject display in its classified bibliography and the possibility of indexing from specific subject terms in its subject index constructed by chain indexing methods. However, in doing so, it created a hybrid from four editions of the Dewey Decimal Classification scheme, onto which were grafted a number of special supplementary schedules. Even this structure was considerably supplemented by verbal extensions of class numbers in the search for co-extensiveness between the subject matter of the works included and the subject analysis carried by the classification and supplementary extensions.

Such a policy inevitably carried the penalty of departure from standard classificatory practice and made it difficult for libraries to obtain the full benefit from adopting the classification applied centrally. The experience does illustrate an attempt to overcome the lack of specificity of one of the most used general schemes of classification, and was an attempt to graft coherent principles onto a structure which inevitably reflected the overall approach of nineteenth century classificationists.

The present policy of the British National Bibliography in this area coincides with the creation of the data-bank of bibliographical records, with its potential for direct distribution of machine-readable records to libraries. In this environment the pressure for centrally applied standards is far more intense. Not only does the record created have to meet the needs of the services and publications of the national bibliography itself, but it should also be possible to utilise the record and the information it contains in the local system without modification as far as possible. Where standards exist these are used - notably the ISBN and, prospectively the ISBD. In default of full standards established codes of practice are followed, as exemplified by the adoption of the Anglo-American Cataloguing Rules. In pursuit of this overall policy the British National Bibliography decided to adopt the current edition of the Dewey Decimal Classification and apply it without modification from 1971 onwards. It also decided to carry on the MARC record both Library of Congress classification numbers and subject headings. Thus the information carried meets the needs of users of three existing main-line systems. The extension of this practice to include Universal Decimal Classification numbers is desirable.

The fundamental problem in this area is the non-existence of universal standards. Not only is there the basic problem in the lack of a standard classification scheme, but also at a secondary level there is the need for a standard code of practice for the use of schemes which do exist. UDC, for example, has a highly flexible citation order which can be varied according to the needs of a user. For information to be carried effectively throughout a network an agreed citation order would become essential. The Library of Congress Classification demonstrates problems of a different order, since in many areas of the classification, where notational arrays are developed for new specific subjects that arise from a mnemonic alphabetical base further differentiated by numbers, only the central classification agency can allocate the notation. There is no mechanism whereby the user can develop the notation for new subjects with the assurance that it would match that allocated at the centre. The Library of Congress classification also lacks

the scope notes and instructions, well exemplified in current editions of the Dewey Decimal Classification, which aid consistent classificatory practice.

The approach demonstrated in the BNB/MARC network is one which reflects the adoption of a number of "quasi-standards" of subject descriptors i.e. those established in the general schemes, together with a move to use those systems as they stand without modification.

This multi-system approach is developed as a powerful subject control sub-system of computer programs which is linked with the PRECIS indexing system. In fact, the multi-subject control derives directly from the intellectual basis of the concept analysis carried out as the preliminary step of creating the PRECIS index entries.

Briefly this operates as follows. Each work received is analysed for subject content, which results in a summarisation of the subject matter of the work at monograph level. The words in the summarisation are then matched against a set of operators, and terms in the summarisation are coded and ordered into a context dependent statement of terms or concept analysis. This concept analysis is successively translated into the appropriate class numbers of the Dewey Decimal Classification, the Library of Congress classification, and into subject headings drawn from the Library of Congress list of subject headings. The terms present in the concept analysis are also subsequently re-coded with the manipulation codes which control the generation of the PRECIS index entries. The subject data package also acquires the Reference Index Numbers (RINs) which give access to a machine-held file which contains all appropriate hierarchical and synonym references. This multi-subject statement is added to a disc-held file of subject information and is identified from that point on by a nine digit address code which relates to it. This address code is entered on MARC record at input, and at a later file handling stage the appropriately tagged information is transferred from the subject file to the MARC record itself. When an identical subject is handled subsequently, the address code is extracted from the authority file and cited at input, resulting in the direct transference of all subject information without further intellectual or clerical intervention. An example of the authority card for this multi-subject control together with the index entries deriving from it is shown as Appendix V.

While it is not suggested that it is desirable for an information network to operate in a multi-subject system mode, such a system does offer a modus operandi where there is no overall agreement on one subject descriptor standard acceptable to each country or institution, leading to the situation that more than one system would have to be accommodated. There are strong arguments in favour of using a classification scheme as the standard subject descriptor system in a multi-national context since it not only provides a meta-language which is trans-lingual, but also provides through the classification both a means of offering a contextually organised display of subject information, while retaining the inherent possibility of organised subject search and retrieval through its notational mechanisms in the machine held file. The Universal Decimal Classification with its international basis of development and its wide international acceptance is probably the most suitable scheme for adoption as the standard subject descriptor system at present.

Standard subject indexing control

Perhaps the most significant advance in indexing techniques for subject control in the past few decades was the development of the chain-indexing system, which essentially relied on the hierarchical structure of the classification scheme to which it was related. It offered the indexer a controlled approach to the task of indexing, provided the structure of approach, the necessary qualifiers to be built into an index entry, and, to a large extent, the indexing vocabulary. It also met the external criterion of the need for economy in index construction. Nevertheless, it possessed a number of deficiencies. The automatic inclusion of index entries representing higher terms in the hierarchy when indexing a more specific subject could lead to the presumption on the part of the index user of the presence of information on subjects not necessarily present, although the inclusion of such terms allowed to some degree for generic to specific search, and also for the approach of a user generalising the terms of a specific enquiry.

A further problem was that index entries for compound subjects provided only a uni-directional approach to the subject at the level of specificity of the information recorded. For example, the index entry

France : Women : University education

makes no provision for the user who approaches the index for the same subject searching under either

Women : France : University education, or

University education : Women : France.

The presence in the chain index of the entries at the higher generic level i.e.

Women : University education, and

University education

fails to display accurately the true information content of the file.

These problems were further aggravated by the inconsistent order of elements in the citation order of the classification scheme itself, with reflected inconsistency of pattern in the index entries. For example, in the Dewey Decimal Classification scheme "management" would not occur as the lead term for certain compound subjects, whereas in others, because of the different citation order in other subject fields, chain-index procedure would require "management" as the lead term in the index.

Such inconsistencies could only cause uncertainty on the part of the index user if the occurrence of the inconsistency were recognised. Alternatively the index user would recognise the existence of certain terms as lead terms and wrongly presume that there was a consistent order present based on such lead terms. He would then experience a subsequent failure to find other relevant information which did not reflect the assumed pattern.

A further deficiency of chain indexing is its failure to indicate the role a term plays in a subject context. Thus the index entry

Computers : Management

could equally mean Computers in Management or the Management of Computers.

The PRECIS indexing system which has been used by the British National Bibliography from 1971 is a system which has overcome these deficiencies. It is a rotated index which gives equally precise index entries under each significant term of compound subject. The potential for generic to specific search is provided for by means of the linking structure of references. The order of citation based on the system of operators is consistent through all subjects dealt with. The problem of roles is dealt with by the user of prepositional phrases which are constructed by the program manipulation of coded sub-elements present in the index string.

The relational operators, the display pattern of entries, the pattern of analysis and coding, and the resulting index entries and reference structure are shown in Appendix VI. The most recent explanatory article on the PRECIS system is found in ASLIB proceedings Volume 22, No. 10, October 1970 (13).

The PRECIS system can be taught quite readily, and once understood by the indexer provides an elegant controlled approach to indexing problems. It is important to note, too, that since it is entirely independent of a particular classification scheme, it can, unlike chain indexing, be used to index back to information arranged by any classification scheme to which it was related at input. Should the BNB/MARC file be produced in the sequence of the Library of Congress classification the PRECIS index entries would lead back to information held in that order with the same precision that it does to the Dewey arranged file.

PRECIS operates on the basis of a controlled but open-ended vocabulary. New terms are added to the index vocabulary against the needs of the literature handled for subject analysis. As new terms are added they are considered for synonym control and built into the hierarchical reference structure.

Since the concept analysis underlying the PRECIS system itself lays down a citation order for elements of a compound subject there is a very real possibility of deriving acceptable subject headings from the same data. This possibility should be considered in relation with the problem of arriving at a standard subject descriptor system. Potentially it could provide the complementary verbal subject heading control to that offered by the chosen classification scheme. The following simple example demonstrates the possibility. The subject referred to earlier "University education of women in France" gives rise to the coded concept analysis:

(6) France (4) Women (3) University education.

The citation order which demands context dependency will in most cases ensure that place, when present, is the first term cited. This is probably not the most acceptable citation order for a subject heading. It is clear, however, that if a subject heading algorithm could be agreed upon, subject headings

could be created from the data held in the subject index string as long as the operator codes were preserved as part of the input data. In the example cited the order (4) (3) (6) giving rise to the subject heading:

Women - University education - France

seems entirely acceptable.

Clearly there are advantages in system terms if both the verbal subject descriptors and the full subject indexing control can be derived from the same data input.

Derek Austin, who has been responsible for the development of the PRECIS system, has been particularly interested in the effectiveness of the performance of the manipulation codes when languages other than English have been used to create manipulation strings. Small indexing samples have been tested in a number of languages including Persian, Russian and Sinhalese, as well as in the more widely known European languages. Results have been successful in every case.

A fruitful line of development lies open which will link three ideas, namely those of

(i) a multi-lingual thesaurus*

(ii) a controlled indexing discipline, and

(iii) inverted machine held files which will translate from a language term into a thesaurus address code and out of the thesaurus address code into a chosen language.

By linking these ideas it would be possible for each country to create index strings in its own language for internal handling and control. For exchange purposes terms present in these index strings would be converted into the numeric codes representing those concepts in the thesaurus. A similar process would translate out of the numeric code into the language of the recipient nation.

Standard format coding

The Library of Congress has produced a series of MARC formats covering non-book materials. Those published or in draft include Maps (14), Films (15), and Sound Recordings (16) and thus make effective provision for a large part of non-book media. A code indicating type of record is held in character position 6 of the leader. These formats follow a common pattern in that the majority of fields use exactly the same field tag coding as that established in the format for monographs (17).

A comparison between the formats for non-book materials and that for books show the following differences in the variable field tags used:

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* This is the subject of another EUDISED paper by Mr. J. Viet.

Fields present in formats for non-book materials not present for books

MAPS

017 - Copyright registration number

052 - Map classification code

507 - Scale note

SOUND RECORDINGS

017 - Copyright number

262 - Imprint

305 - Physical description

511 - Participants or performers

MOTION PICTURES, FILMSTRIPS etc.

020 - Standard Film Number

261 - Production and release

301 - Physical description

308 - Physical description (for archival materials)

359 - Rental price

501 - Two or more works on one reel, etc.

506 - Limited use note

508 - Credits note

511 - Cast note

517 - Categories of film (for archival collections)

This comparison is interesting since it reflects three different situations. Firstly the need for new information fields for certain types of records, e.g. field 017 for maps and sound recordings. Secondly the need for a more closely defined field for types of information e.g. the scale note for maps or the rental price field for motion pictures. The third group is holding information of the same general category as that for other types of media, but it has been placed in a unique field, presumably because of the need for special sub-field code provision. The policy pursued is by no means consistent. There are, for example, special fields developed for the imprint data or its equivalent for both sound recordings and motion pictures, yet it could be argued that this information could be held in the same imprint field as used for books as long as adequate sub-element provision were made for

relevant data to be held. The imprint field in the case of maps remains exactly the same as that for books. This situation has been tacitly recognised in one other field at least. Field 020 defines Standard Film Number in the Motion Pictures format, whereas in the monograph format this field holds standard book number information. Similarly field 511 holds information of participants and performers for sound recordings and the cast note for motion pictures. Since the medium is distinguished in the type of record code carried in the leader it should be possible to use the same field tags with analogous meaning for any type of record, developing within each field the necessary sub-element provision to contain any data which may occur in the full range of non-book media.

The closeness of the individual non-book formats to that of the book format is encouraging and demonstrates the possibility of creating a single format for all types of record. This is an area which would benefit from further investigation as the results are likely to be fruitful. If this multi-media approach were followed it should in turn allow standard programs to be developed to meet output requirements for all types of media within a generalised program structure.

Standard information code control

Information codes in fixed field positions in the record will allow rapid machine search by any encoded characteristic or combination of characteristics. The MARC II format for monographs holds this information in a fixed field of 40 characters in tag position 008. The codes carry such information as dates of publication, country of publication, language of text, types of illustration, type of reference work, type of publication, literary form etc. In the format for maps the 008 field holds similar information adjusted to the needs of the material handled including, for example, codes relating to type of relief, to projection and so forth.

The format for sound recordings utilises two fixed fields. These are:

007 - Physical description fixed field

008 - Fixed length data elements

The physical description fixed field contains 6 positions which relate to form of release (e.g. phonodisc, phonotape), speed, standard groove or microgroove, number of channels, size, and tape configuration. A variable number of 6-character entries is allowed to provide physical description information about the work and its versions.

The film format utilises three fixed fields:

007 - Physical description fixed field

008 - Fixed length data elements, and

009 - Physical description fixed field (for archival collections).

The inclusion of more than one fixed field carrying encoded information suggests that the limitation of 40 characters in the 008 information field is inadequate to cover the wide range of characteristics needed for the adequate identification of the technical information and other requirements of non-book media. However the limitation of 40 characters is obviously an arbitrary one. If a format were developed which covered the needs of all non-book media it is suggested that the fixed field information code area be developed to enable all possible characteristics to be encoded in one area of the record.

Earlier in this paper the problem of the degree of specificity of the medium designator was discussed. It is relevant to comment here that the degree of specificity chosen should be reflected in the code held in the leader. The Library of Congress non-book formats hold a general code in the leader and rely on specific information encoded in the fixed field to refine this information.

Standardisation would be aided if a full non-book media format could be developed which shared a common record structure, in which the fixed field information unique to each particular medium could be held in a single field, and in which the variable fields reflected a common structure of tagging with sub-element provision such that any data element necessary to the description of a particular medium could be held in an appropriate analogous coded area.

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A P P E N D I X E S

to

J E Linford's Study

APPENDIX I
(not facsimile)

HIGHER EDUCATION LEARNING PROGRAMMES INFORMATION SERVICE

RECORD OF MATERIAL
(One form for each item)

Name of institution:

General subject:

Precise topic:

Title:

Summary of contents:

Learners for whom intended:

When made: (year) Running time:

Points concerning use (e.g. additional material or circumstances in which found effective):

Any restrictions on use (please specify):

Further details obtainable from:

Date of completion of form:

TECHNICAL DETAILS
(please complete appropriate section)

FILM
Col. ☐
BW ☐

35mm ☐
16mm ☐
Super 8 ☐
Standard 8 ☐
Super 8 loop ☐
Standard 8 loop ☐

Sound:
com. opt. ☐ mag. ☐

Edited ☐
Un-edited ☐

TV 2" tape ☐

1" tape:
- Ampex 7803 ☐
- 7003 ☐
- 5103 ☐
- IVC/B&H ☐
- Philips ☐
- Other ☐

(please specify)_____

½" tape:
- Sony ☐
- Shibaden ☐
- Other ☐

(please specify)_____

SLIDE SEQUENCES
- Col. ☐
- BW ☐

With tape ☐

Synchronised:
- Yes: reel to reel ☐
- Yes: cassette ☐
- No ☐

With notes ☐

With questionnaire ☐

SOUND

¼" tape:
- cassette ☐
- reel ☐

Compact cassette:
- yes ☐
- no ☐

GRAPHICS

please indicate briefly
physical nature of material

LANGUAGE LAB. MATERIAL

PACKAGED MATERIALS
(case studies, kits, etc.)

National Council for Educational Technology, 160 Great Portland Street, London W1N 5TB

APPENDIX IA

HELPIS RECORD INPUT FORM *(not facsimile)* ...

DEWEY No.	2nd DEWEY No.	3rd DEWEY No.
082000	082000/1	082000/2

VERBAL EXTENSION OF DEWEY No.
083000 083000/1

TITLE *
24501

* Complete last digit if tag with no. of non-filing characters e.g. The history... has 4 non-filing characters

INSTITUTION $a $b
260000 $c $d

$a = Place $b = Name of institution $c = Year of production
$d = Name & address for full details

MEDIA TYPE
350000

PHYSICAL DESCRIPTION $b
300000 $c

$b = Specificationse.g. st., col., standard 8 loop $c = Running time

SUMMARY OF CONTENTS
500000

LEARNERS FOR WHOM INTENDED
500000/1

POINTS CONCERNING USE
503000

RESTRICTIONS ON USE
503000/1

008000 $ben
$ja

TECHNICAL DETAILS

(please complete appropriate section)

FILM $d

Col. ☐ a
BW ☐ b

35mm ☐ c
16mm ☐ d
Super 8 ☐ e
Standard 8 ☐ f
Super 8 loop ☐ g
Standard 8 loop ☐ h

Sound:
com. opt. ☐ i
mag. ☐ j

Edited ☐ k
Un-edited ☐ l

$jb TV
$d

2" tape ☐ a

1" tape:
Ampex 7803 ☐ b
7003 ☐ c
5103 ☐ d
IVC/B&H ☐ e
Philips ☐ f
Other ☐ g
(please specify)_____

½" tape:
Sony ☐ h
Shibaden ☐ i
Other ☐ j
(please specify)_____

$jc SLIDE SEQUENCES
$d

Col. ☐ a
BW ☐ b

With tape ☐ c
Synchronised:
Yes: reel to reel ☐ d
Yes: cassette ☐ e
No ☐ f

With notes ☐ g
With questionnaire ☐ h

$jd SOUND
$d

¼" tape:
cassette ☐ a
reel ☐ b

Compact cassette:
yes ☐ c
no ☐ d

$je GRAPHICS

$jf LANGUAGE LAB.

$jg PACKAGED MATERIALS

APPENDIX IB

NCET HELPIS (HIGHER EDUCATION LEARNING PROGRAMME INFORMATION SERVICE) RECORD FORM *(not facsimile)*

For local use	Item Number ..... Date form completed .....

CONSULT GUIDANCE NOTES BEFORE COMPLETING FORM

Item Title

Series Title

Name of Institution Master held by

Commissioning Dept. and Date

Summary of Contents, with details of special production features

Author(s)	Running Time .....mins
Presenter	Supplementary materials .....
Other Participants	.....
Intended Use	Restrictions on use .....
.....	.....

	TECHNICAL DETAILS OF MASTER COPY (Tick box as appropriate)	For office use only
FILM	BW ☐ Col ☐ 35mm ☐ 16mm ☐ Std. 8 ☐ Super 8 ☐ loop ☐ loop ☐ Sound: Com opt ☐ Com mag ☐ Sep mag ☐ Silent: 16fps ☐ 18fps ☐ 24fps ☐ 25fps ☐ If loop, cassette type	$ja $d
TV	BW ☐ Col ☐ High band ☐ Low band ☐ Tape width ..... inch Machine make and type	$jb $d
SLIDES or FILMSTRIPS	BW ☐ Col ☐ Number of frames .....With sound ☐ (And complete Sound Tape section)	$jc $d
SOUND TAPE	Tracks: 2 ☐ 4 ☐ Reel ☐ Cassette ☐ Stereo ☐ Speed .....ips If synchronised to slides, system ..... If Cassette, type	$jd $d
OTHER MATERIAL	Description & details	$je

RIDDLE	AECT STDS	PLUNKETT	GENESEE	HARRIS	WESTHUIS
APERTURE CARD					
ART PRINT	✓				
CHART	✓		✓		✓ (C)
DIORAMA	✓				
FILMSLIP					
FILMSTRIP	✓	✓ (FS)	✓ + FILMSTRIP SOUND	✓ (FS)	✓ (FS)
FLASH CARD	✓		✓		✓ (FC)
FLIP CHART					✓ (GA)
GAME	✓		✓		
GLOBE	✓		✓		✓ (G)
KIT	✓	✓ (KT)	✓	✓ + TEACHING DEVICES (TA) /realia, models, relief maps/	(K)
LABORATORY KIT					
MAP	✓	✓ (M)	✓	✓	✓ (M)
MICROFICHE	MICROFORM /microcards microfilms/ + microfiches + aperture cards	✓ MICROCARDS (MC)			
MICROFILM		✓ (MF)			
MICRO-OPAQUE					
MICROSCOPE SLIDE			✓		

MODEL	✓	✓ (MD)	✓ + SPECIMEN		✓ (MO)
MOTION PICTURE	✓	✓ 16mm FILMS (MP) 8mm FILMS (F)		✓ (MP) /loop films/	✓ FILMS (F)
MOTION PICTURE LOOP			✓ FILM LOOP + FILM LOOP SOUND		
PHONODISC	✓	✓ RECORDS (RC)	✓ RECORD	✓ RECORDINGS (R)	✓ RECORDINGS (RE) + RECORD ALBUMS (RA)
PHONOTAPE	✓ AUDIOTAPE	✓ AUDIOTAPE (T)	TAPE, AUDIO	✓ (T)	✓ TAPE RECORDINGS (TR)
PICTURE	✓	✓ (PI)	✓	✓ (PC) posters, charts art, prints	✓ /posters/ (PI)
REALIA	✓ SPECIMEN /realia/				SPECIMENS (Sp)
RELIEF MODEL					
SLIDE	✓	✓ (SL)		✓	✓ (SL)
STEREOSCOPE SLIDE		VIEWMASTER (VM)			
STUDY PRINT	✓				/transparencies/ (ST)
TRANSPARENCY	✓	✓ (TR)	✓	✓	
	VIDEOTAPE COMPUTER TAPE	VIDEOTAPE	TAPE, VIDEO		EQUIPMENT (EQ)
	MOCK-UP				

NOTE: Riddle was used to produce the base list as this has the largest number of distinguished items. Where these are present in other codes, the column is ticked. Variant terminology is given where appropriate in the parallel columns. Symbols represent the abbreviations used in the call mark. The plus sign indicates further distinguished categories. Square brackets show item included in the definition.

APPENDIX III

STANDARD BIBLIOGRAPHIC DESCRIPTION

The following outline shows the elements in the Standard Bibliographic Description and their order.

1. Title and statement of authorship area

    1.1 Title proper

    1.2 Parallel titles, other title(s) and title information

    1.3 Statement(s) of authorship

2. Edition area

    2.1 Edition statement

    2.2 Statement(s) of authorship relating to the edition

3. Imprint area

    3.1 Place of publication

    3.2 Name of publisher

    3.3 Date of publication

    3.4 Place of printing

    3.5 Name of printer

4. Collation area

    4.1 Number of volumes and/or number of pages

    4.2 Illustration statement

    4.3 Size

    4.4 Accompanying materials

5. Series area

6. Notes area

7. ISBN, binding & price area

   7.1 ISBN

   7.2 Binding

   7.3 Price

THE LIBRARY ASSOCIATION

RESEARCH AND DEVELOPMENT COMMITTEE

MEDIA CATALOGUING RULES COMMITTEE

ORDER OF ELEMENTS IN A MAIN ENTRY

RULES / ELEMENTS	AACR+ RIDDLE: FILMS	AACR+ RIDDLE: RECORDINGS	AACR PICTURES	RIDDLE: OTHER MEDIA	NFA+ ASLIB: FILMS	DAVI M	PLUNKETT U L T	HARRIS I	KEEN M	WESTHUIS E D I	GENESEE A
AUTHOR/ARTIST/ COMPOSER + conventional title		*1	1	*1			*1	*1	*2	1	*1
TITLE	1	3 or 1	2	2	1	1	2	2	3	3	3 or 1
MEDIUM DESIGNATION	2	2	6	3		2	6	3 or 9	1	2	2
SPONSOR	3				3	*3b					
PRODUCER + serial no. (for records)	4	4	4	4	4	3+ edition	3	4	4	4	4
DISTRIBUTOR	5				13 (NFA)	*3c			$		
COUNTRY OF ORIGIN			3		6						
DATE (see note)	6	5 *Riddle	5	5	7	4	4	5	*5	5	5

NO. OF ITEMS/ FRAMES/SIDES		6		6			5	6	6	6	6
LENGTH/RUNNING TIME	7				12	5	8			12	11
SOUND	8				9	6	10	7	7	9	9
COLOUR	9		7	7	11	9	9	8	8	8	8
SIZE (width, diameter or dimensions)	10	7 *Riddle	8	8	8	10	7	10	9	7 or 13	7
SPEED		8				7	11	11		10	10
FORM OF PRINT/ RECORDING		9			10	8		12		11	
SERIES	11	10 *Riddle	9	9	2	11	12	13	10	14	12
CREDITS	13	12 *Riddle			5	14	15	15	12		13
CONTENTS/ SUMMARY often combined	14	13 *Riddle		11	14	12	14		13	16	14
NOTES	12	11 *Riddle	10	10	15	13	13	14	11	15	15

* indicates an element which is not always used. See M 11 for use of author as heading.

Date usually means date of publication or release, as given on the material itself. Where this is not available, or in the case of unpublished material, the date of production is given.

APPENDIX V

SUBJECT AUTHORITY CARD *(not facsimile)*

Front

CA # 623 08080 9	082 010 599'01'88	050000 QP 368	SIN 010300023

083 Mammals. Autonomic nervous system. Effect of drugs

(4) Mammals
(p) Autonomic nervous system
(3) Effect-of-on
(2) Drugs

690000
$Z101 $a mammals
$Z101 $a autonomic nervous system
$Z $
$Z $
$Z004 $t effect $m of $r on
$Z101 $a drugs
$Z $
$Z $
$Z $
$Z $
$Z $
$Z $

TURN OVER FOR 610-650 & 692

Back

RIN's		LCSH
692 000	000 303 135	650 Nervous system, Autonomic
692 000/1	000 207 055	650/1 Neurochemistry
692 000/2	000 207 128	
692 000/3		
692 000/4		
692 000/5		
692 000/6		
692 000/7		

SUBJECT INDEX ENTRIES

Mammals
Autonomic nervous system. Effect of drugs 599'.01'88

Autonomic nervous system. Mammals
Effect of drugs 599'.01'88

Drugs. Effect on autonomic nervous system. Mammals 599'.01'88

ASSOCIATED REFERENCES

1. RELATIONAL OPERATORS

(a) Form: physical (e.g. Microform) or narrative (e.g. Journal).
(b) Target: e.g. For engineering
(/) Quasi-generic relationship
, Difference: e.g. concept used adjectivally
(p) Part, Material, Property or Percept
(0) Study region; Sample population
(1) Viewpoint, perspective
(2) Active concept, aspects, factors
(3) Effect, action
(4) Key system
(6) Environment

(v) Coordinate concept
(w) Relationship between coordinate concepts
(x) Coordinate theme

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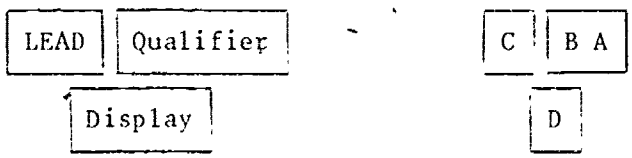
2. STRUCTURE OF PRECIS ENTRIES

A/B/C/D



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3. PRECIS IN OPERATION

i) Subject: The professional education of teachers at universities in France

ii) Concept analysis
(6) France (4) Teachers (3) Professional education
(2) Universities

iii) Entries

FRANCE
Teachers. Professional education. Universities
TEACHERS. France
Professional education. Universities
PROFESSIONAL EDUCATION. Teachers. France
Universities
UNIVERSITIES. Professional education. Teachers. France

iv) References

EDUCATION See also TEACHERS
MAN See also SOCIETY
SOCIETY See also SOCIAL CATEGORIES
SOCIAL CATEGORIES See also OCCUPATIONAL CATEGORIES
OCCUPATIONAL CATEGORIES See also TEACHERS
EDUCATION See also PROFESSIONAL EDUCATION
TRAINING See also PROFESSIONAL EDUCATION
COLLEGES See also UNIVERSITIES
EDUCATION See also HIGHER EDUCATION
HIGHER EDUCATION See also UNIVERSITIES

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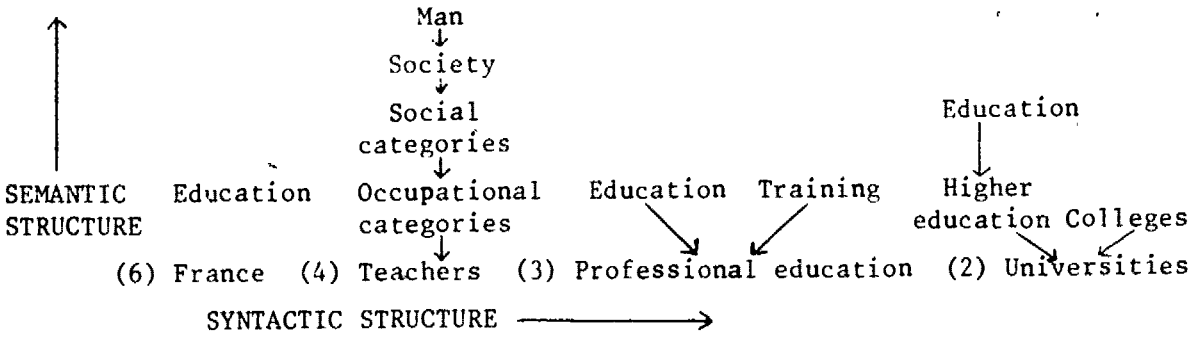
4. SYNTACTIC & SEMANTIC STRUCTURE



THE ORGANISATION OF A DECENTRALISED NETWORK FOR THE EXCHANGE OF EDUCATIONAL INFORMATION AT THE EUROPEAN LEVEL

by

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Starting with a survey on some probable trends and their impact on documentation and information systems, this study proceeds to tentatively describe the education community, the scope and goals of the EUDISED system, and problems of knowledge utilisation; it then attempts to specify the functions of the elements of the EUDISED system.

Since the *Report of the Working Party on the Application of Computer Techniques to Educational Documentation and Information* was published in late 1969 (1), a great many reports on new documentation and information ventures have been issued. Among those of fields neighbouring education are the various reports of the Language Information Network and Clearinghouse System (LINCS) that began with a survey and analysis stage (1967-1968), followed by a preliminary system design stage (1968-1969), and then entered its advanced system design stage lasting until July 1971, when the system acquisition or implementation phase of four to five years began. Some of the statements on the following pages can, therefore, profit by reference to the LINCS project and its careful analyses and design specifications.

1. TECHNOLOGICAL TRENDS

In 1970, a total of 111,600 computers were in use in various areas of the world (Diebold). Of them, 73,700 were located in the USA, 23,900 in Western Europe, 5,100 in Eastern Europe, 7,200 in Asia, 700 in Africa, and 100 in Oceania. The ratio of 1:3 between the number of computers available in Western Europe and the number available in the USA, will, therefore, have to be borne in mind when drawing on the LINCS project for some probable technological trends and their impact on an information network system. It will have to be assumed, though, that EUDISED as a computer-based system would necessarily have to be oriented towards long-term technological trends.

With the emphasis on "achieving the capability to do new things or to do things which were not heretofore economically or technologically feasible" and without engaging in technological euphoria, the LINCS study (2) lists the following trends:

1. "All computing will be on-line by 1975"
2. At least some "special-purpose time-sharing systems will be capable of handling 1,000 simultaneous users"
3. "Systems of the future will be largely cathode ray tube (CRT) terminal oriented"
4. "By 1975, computer hardware will become at least one and possibly two or more orders of magnitude cheaper than current systems"
5. "The cost per bit of core storage will decrease to less than 5 per cent of the current cost"
6. "However, logic and electronic costs are decreasing at a faster rate than storage costs"
7. "Time-sharing technology will evolve into the linking of several or many time-shared (and non-time-shared) computers in networks tied together by common carrier communication

channels. The so-called information utility will be a reality by 1975"

8. "Communication line costs may decrease with greater use of satellites".

Ebersole, the author of the LINCS study quoted above, thinks that computer-processing will be "within the buying range of more and more users", so that "it is highly probable that most information services will utilise on-line services".

The ideal system "would handle full text and would perform syntactical and semantic analysis leading to highly sophisticated content representation". It would also produce "high quality secondary journals, whether these are in the form of abstract journals or bibliographies with associated subject, author, etc. indexes". The Mead Data Central system (Data Corporation) handles full texts but does not yet produce secondary journals. The INTREX project (Massachusetts Institute of Technology) does both "but it is not at the operational stage", i.e. "its services are not available now as a purchasable service".

Considering this present stage of affairs, a decision, therefore, might have to be taken as regards the EUDISED system to give priority to the printing of journals as output and, of course, retrieval programs. Developments in storing full text should nevertheless be watched. At present, computer-storage (IBM 2314) for one page at 15 cents compares rather unfavourably with storage on microfilm or microfiche at one cent only. "Even when digital storage reaches a competitive cost level, microfilm will continue to be the best answer for older documents." Remote access to full text in microfilm storage is being experimented with by the INTREX project. Thus microfiches might have to be the storage medium for full texts for some time to come while computer storage will primarily be used for indexes of bibliographic items. The development of other information carriers, though, will have to be followed closely.

Ebersole also mentions another aspect to be observed in a system depending on the needs of users. He expresses it as a rule for system designers: "If you place a high value on full text search capability, etc., you should integrate this with printing via photocomposition. The major limitation here is that this approach is only feasible when we are dealing with new documents." He thinks this to be "the most advantageous approach for active subject areas where there is both a high publication rate and a sizeable user community".

As regards EUDISED, the combination of full text search with printing via photocomposition does not necessarily imply the printing of primary journals. If, for instance, EUDISED should lay emphasis upon tertiary publications such as trend reports, state-of-the-art reports etc., to help users more successfully to deal with the flood of information, the full texts of such reports could be encoded in digital form on magnetic tapes or discs used for both printing and full text searching.

Finally, Ebersole points to the fact that the language sciences "are characterized by many 'hyphenated' fields". (This is also true for

education.) He therefore suggests that the design of the LINCS system "should include plans on how to tap other data banks". There are, however, four primary obstacles to the attainment of this objective:

1. "Lack of equipment compatibility and a resulting difficulty in reaching a storage medium created by a different type of computer"
2. "Lack of a standard character set"
3. "Lack of compatible file formats"
4. "Lack of transferable computer programs".

These problems would be the same with the EUDISED system. The third problem could be overcome both nationally and internationally only by international agreements. The other three problems concern computer manufacturers. Here, too, international agreements on specifications covering these items are urgently needed.

2. THE EDUCATION COMMUNITY

As no specific assessment or study is available of the education community within the member countries of the Council for Cultural Co-operation, what follows is no more than a first shot at speculating on the quantity and quality of potential users of educational information.

Any attempt to distinguish different categories within the education community invites the reflection that the proportion of the population that is completely unconcerned with education, either directly or indirectly, must be very small. If one considers first the group of over 60 million children at school* and their juniors, totalling some seven million, undergoing education at pre-school level, together with their parents upon whose culture-bound traditions, educational knowledge and practical behaviour they are dependent, then about half the population is already covered.

But the context of EUDISED implies that the categorisation should more usefully be confined to those professionally engaged in education in one capacity or another, or who are likely to be in a not too distant future. In the geographical area concerned there are about three million teachers in primary, secondary, vocational and special schools and some quarter of a million teaching in the tertiary sector. The number of nursery and kindergarten teachers is rather difficult to pin down, but it seems to be at least 150,000 and is probably a lot more. If a quarter of the three million students in the tertiary sector are heading for teaching careers, whether or not they are currently studying educational sciences, then the number of potential teachers to be considered in 750,000. These will later replace older teachers or take care of additional new tasks in the expanding education system.

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* The figures given here for pupils, students and teachers are based on data published in the *UNESCO Statistical Yearbook 1970*.

TABLE 1

Estimated levels of interest in various types of information

	Source or type of information						
	A Research	B Development, Innovation	C Field Experiments	D Planning, Systems	E Statistics	F Teaching Media	G Legislation, Decrees
1 Decision-makers	3	3	3	3	1	3	1
2 Planners	3.2	3.2	3.2	1.2	1.2	3.2	3.2
3 Researchers	1.2.3	3.2	3.2	3.2	1.2	3.2	3.2
4 Administrators	3	3.2.1	3.2.1	3.2.1	1.2.3	3.2.1	1.2.3
5 Consultants in further teacher training	3.2.1	3.2.1	3.2.1	3.2.1	3.2.1	1.2.3	1.2.3
6 Teachers in (higher ed.) teacher trg.	3.2.1	3.2.1	3.2.1	3.2.1	3.2.1	3.2.1	3.2.1
7 Students preparing for teaching	3.2.1	3.2.1	3.2.1	3.2.1	3.2.1	3.2.1	3.2.1
8 Practising teachers	3	3	1	3	3	1	1

N.B. 1 = Primary documents and materials.
2 = Secondary literature, e.g. annotated or enumerative bibliographies.
3 = Tertiary literature: state-of-the-art reports, etc.

These are entered in the table in their estimated order of priority of interest to the user category concerned.

Another, much smaller, group comprises the educational researchers. On the basis of the 1970 Council of Europe survey of current educational research this group might be estimated to number between 1,500 and 2,000. There is a further group concerned only partly with research itself but more with action research or research and development, the emphasis being on the latter. Any figure for this group would be mere guess-work.

Yet another group are the planners in the various ministries or in institutes working on their behalf, who might total only a few hundred. Finally there are the decision-makers. If the ministries only are considered, there may be even fewer of them than planners. True, and depending on legal provisions and the extent to which public opinion is involved, the process of decision-making can take in parliamentarians, press, radio and television journalists, and so on up to major sectors of the community concerned. It is relevant here to refer to the report of an OECD workshop on *Innovation in Education*, held at Cambridge in 1969, which lists the following groups of innovators:

"a) at the national level
- politicians
- industry men/central departments;

b) within the system
- consultants, advisers, inspectors;
- local/regional administrators;
- research and development specialists;
- heads and principals of colleges and schools;
- lecturers in teacher education and at universities;
- leaders of local teachers' groups." (3)

Looking back at the relative numerical size of the various groups identified in this section, one is irresistibly drawn to an intriguing if rather crude visualisation of a pyramidal structure standing on a great plateau. The plateau represents the tens of millions of school children and their parents who are affected by, but not directly concerned with educational information as the term is understood in its EUDISED context. The pyramid represents those who are so concerned; the practising teachers form the base and, leading up through the various strata of future teachers, teacher trainers, administrators, researchers, planners, etc., we find the planners and decision-makers at the apex.

In an attempt to identify for each of these groups of potential users of educational information, the fields or activities which produce relevant documents and materials, as well as the kind of document preferred by each group, a distinction will be made between

1. primary documents and materials
2. secondary literature e.g. annotated or enumerative bibliographies
3. tertiary literature: state-of-the-art reports etc.

Table 1 gives the author's estimates of orders of priority of interest in these three classes of document, broken down by field or activity giving rise to the document, and eight selected categories of potential users.

There are three further aspects involved when trying to identify processes within the education community: first, the process of decision-making, second, the impetus for decision-making, and third, the relevance of information to both.

A UNESCO survey of 1963 (4) states that the education community throughout the world is being served by some 5,000 journals, bibliographies etc. The number of books was not included. An estimate for educational journals refers to some 1,750 educational periodicals within the member countries of the Council of Europe. This figure excludes many journals addressing parents or parent groups, and school magazines. A recent UNESCO study on research in medicine and information (5) revealed that about 4.5 million articles, occupying some 100 million pages, are published in this field annually. Only 45,000 articles, however, i.e. one per cent of all medical publications, could be considered originals. The remaining 4.455 million documents had drawn on those originals or originals published earlier. It is scarcely conceivable that the field of education would yield a higher percentage of original material. It must be expected, though, that to the extent that education must tap the resources of neighbouring fields, e.g. psychology, sociology, and medicine as well as many more specialist fields, the net yield of original findings relevant to education would be about 10 per cent originals, provided that those fields and specialisms are sufficiently well organised - e.g. by the help of state-of-the-art reports - to prevent strangers becoming lost in their jungles.

Another fact has to be mentioned with respect to the "information pollution" arising from an excessive number of documents drawing upon a few original findings. This has to do with the impermeability of barriers existing between different groups of producers of data on the one hand, or between those groups and practitioners on the other. Havelock and Benne (1966) (6) found "among factors which seem to cause boundaries to be more or less permeable... references to age and education levels, geographical separation, cohesiveness (psychological distance), and perceived external threat (self-preservation)". Thus a great number of publications interpreting the same findings can be found.

An important role in breaking down barriers between researchers and practitioners in education is played by the modern mass media: press, illustrated papers, film, radio and television. Although blamed for manipulation of information and ideological bias, with varying degrees of justification, these media are nevertheless primary sources of educational information for parents and many other groups omitted from Table 1, and even included in it. The mass media cannot be ignored in an up-to-date model of information flow processes. To illustrate this point, a study made in connection with the LINCS project indicates that "about two to four and a half years elapse between initiation of a research report and its publication in a journal or in conference proceedings. Approximately one and a half years after this, a little over 50% of the items have been covered in secondary publications." (7) This time lag would not be so different for education, except that it has very frequently been reduced by the mass media, whether or not in co-operation with researchers. In fact though, the interests of the media and researchers have in most cases coincided in early "publication" involving co-operation, particularly on television.

From the point of view of educational documentation, the mass media must, therefore, be considered either as a competitive system or as a linking agent. Furthermore, the way in which educational documentation is organised will determine whether the mass media prefer to "blow up" individual educational issues or whether the media writers will be able to rely on broader sources covering a given area of education.

It must be stressed again that decision-making is in effect no longer confined to only a few persons. The demand for democratisation and for openness of and a participation in decisions, and the necessary public support for their implementation require a broader flow of information encompassing much larger target populations if not the whole of a community, a region, or a nation. This requires of national documentation and information systems not only adequate selection and processing of data but also their transmission in a form both understandable and acceptable to the receiver.

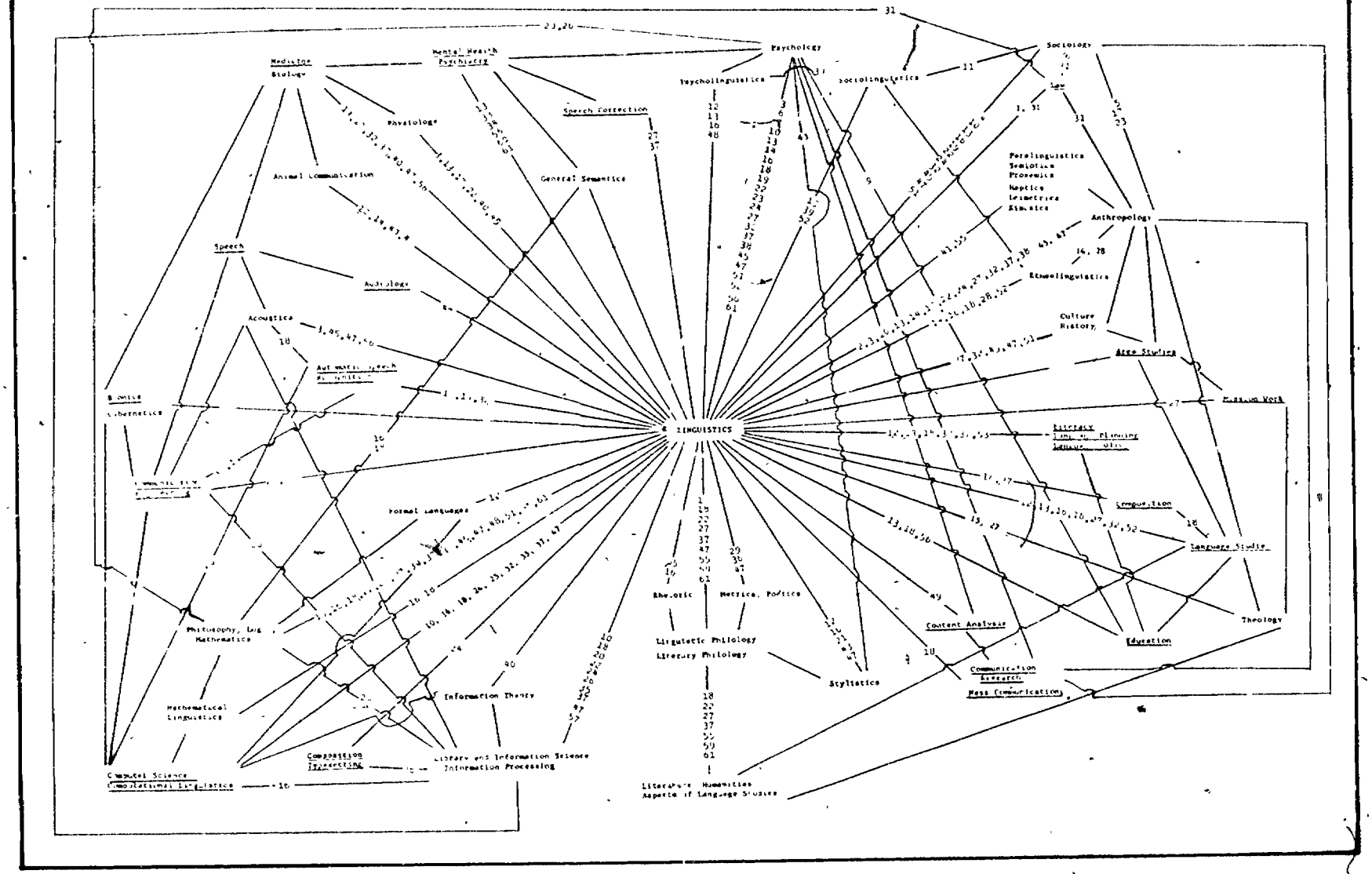
To sum up this section: the education community for whose benefit EUDISED should be conceived comprises more than researchers, decision-makers and planners scattered throughout Europe; development of the system must take a more comprehensive approach, it must be designed to serve, directly or indirectly, a broad segment of the community with various types of educational information.

3. SCOPE AND GOALS OF THE EUDISED SYSTEM

The Working Party preparing the first EUDISED report underlined the expansion of specialist fields, the increase in interdisciplinary fields and the increase in the need for problem-oriented information; it was not too specific, however, in delineating the subject scope of education. The EUDISED Steering Group responsible for the second EUDISED report goes a little further in trying to identify the relevant subject scope. This identification includes institutions and fields, educational technology and teaching methods, curricula and syllabuses, subjects taught, data on the individual and society, and on educational planning and policy (see Appendix). The Steering Group, furthermore, distinguishes between certain fields or activities producing relevant documents: research, development and innovation, field experiments, planning and systems, statistics, teaching media, and legislation (regulations and decrees). In a pragmatic approach, to identify projects that might be incorporated in the EUDISED system, a survey was made using the matrix shown in the Appendix, asking at the same time for information on coverage and types of literature. In addition, a study was commissioned on *the educational sciences in their relations with the social and human sciences. Determination of the field they cover, or the basis of existing documentary instruments.*

Though all these limited efforts could not possibly have resulted in such an elaborate specification of the field as could be achieved with the LINCS project (see Figure 1) (8), the information thus available concerning EUDISED points to the following problems:

Figure 1 *Specialty fields in the language sciences* (8)



1. If data from all fields or activities (A to G in the Appendix) are to be used for retrieval, the same machine readable format will have to be used with all of them, i.e. there should be sufficient elements in the format to include, for instance, teaching media etc.

2. If all subject fields contained in the Appendix (100 to 704) are considered as relevant to education, provision will have to be made

   a) to gradually improve on the present arbitrary array of documentary activities,

   b) to oblige any present or future computer-based documentary activities in the field to adhere to an agreed set of standards, and

   c) to tap existing resources in fields neighbouring education, e.g. psychology and sociology, and to come to agreements on standards when they are being developed on the basis of computer processing.

3. Although EUDISED will probably come into being by starting with one or other subject field or activity, this should be done with regard to the total frame of reference of educational documentation, as tentatively described by the Steering Group.

In his report on the LINCS system (1969), Roberts mentioned that "the audience for an information system in the language sciences is highly diversified in subject concerns and professional and scientific activities" but that the "difficulties engendered by this diversification... could not have been avoided by a narrower definition of the field: information generated in one of the language sciences may have, either in its original form or in some permutation, a very high transfer value for several other fields". (9)

As EUDISED "is conceived as one of the regional educational documentation and information systems... (aiming) to evaluate, compress, and organise literature and other educational material for information purposes" (10), it should do so according to a comprehensive frame of reference that might need further specification and possibly extension, too, in for instance the higher education field. This comprehensive approach would include, though, co-ordination and co-operation with such systems as LINCS, as is the case already with the Informationszentrum für Fremdsprachenforschung, Marburg, which is a member of the Dokumentationsring Padagogik, and with the Centre for Information on Language Teaching (CILT), London.

4. PROBLEMS OF KNOWLEDGE UTILISATION

There are varying predictions as to when information networks will be available via terminals in individual homes as a common carrier like the telephone. Ebersole predicts that technically by 1975 all computing will be on-line in the USA (11). This might be considered a first step towards the development of a network described above. Steinbuch considering the

situation in the Federal Republic of Germany and "its life-endangering weaknesses of infrastructure" e.g. environmental contamination, traffic problems, inhospitable urban areas etc., thinks that an information network as commonly accessible to the public as the telephone will not be available before 1990, possibly much later. Its implementation would cost billions of DM and involve thousands of scientific and technical specialists. (12)

Assuming that the problems of knowledge utilisation will have changed altogether by 1990 - to be replaced by different ones - we shall be living for the next two or three decades in a period of transition, trying to establish standards for international compatibility for exchange of data, setting up rules for analysis of documents and materials, developing educational computer-based networks, and struggling with various kinds of retrieval and SDI to meet the needs of users. While user needs might be electronically registered and the network be kept catering for even occasional individual inquiries after 1990, an interface between the emerging documentation and information services and users has yet to be developed.

Most of the user studies so far available are more or less an extension of old library statistics adopted by documentalists. They are not so much concerned, therefore, with knowledge utilisation and with person-and-relationship technologies in the process of knowledge transfer. Nor do they distinguish between "knowledge about" primarily produced by researchers and "knowledge by acquaintance with" typical for the practitioner (13). To improve upon the qualitative level of user studies it may, therefore, be helpful to present the more general framework in which problems of knowledge utilisation may be located and diagnosed that was suggested by Havelock and Benne on the basis of an exploratory study (1966) (14):

For Havelock and Benne there "seem to be two ways to conceptualize utilization. One way is as a system and the other as a process. A system model of utilization uses concepts such as 'organisation', 'group', 'person', 'agent', 'position', 'role', 'channel' and 'link'. A process model includes such concepts as 'relationship', 'linkage', 'transfer', 'exchange', 'translation', 'diffusion' and 'communication'". The authors think that knowledge utilisation cannot be properly understood without using both models.

Concerning the structure of utilisation Havelock and Benne discriminate between *flow structure* and *administrative structure*. "Two concepts are essential for the understanding of the flow structure of utilization. These are 'barrier' and 'unit of information'. 'Barriers' are the defining and identifying limits of any group or any individual, and they are the *differences* between the frame of reference of the sender and the frame of reference of the receiver. 'Unit of information' refers to the substance of knowledge which is being transmitted, whether it be in the form of an idea, an observation, working model, finished manufactured product, advertising copy or professional service. 'Units of information' also refers to requests, questions, demands, payments, greements, and OK and distress signals of every variety, these latter being units typically employed in 'feedback' or 'control'." Figure 2 shows a simple utilisation system, Figure 3 illustrates the resource access problem, and Figure 4 the utilisation system of the American Telephone and Telegraph Company. (15)

Figure 2 *A simple utilization system* (15)

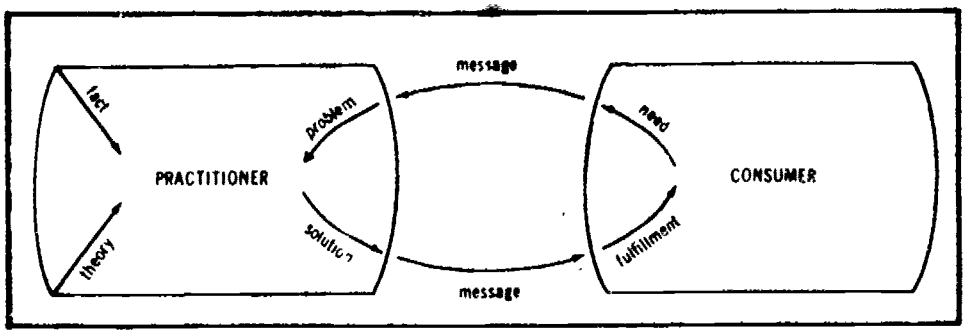
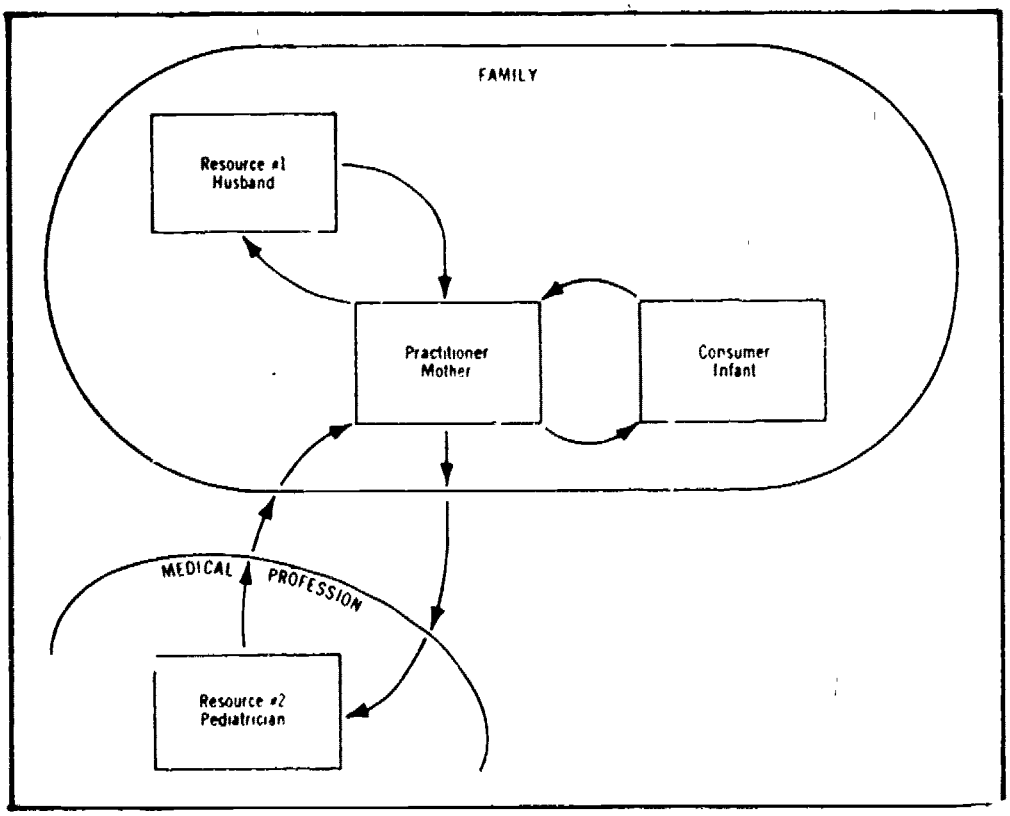
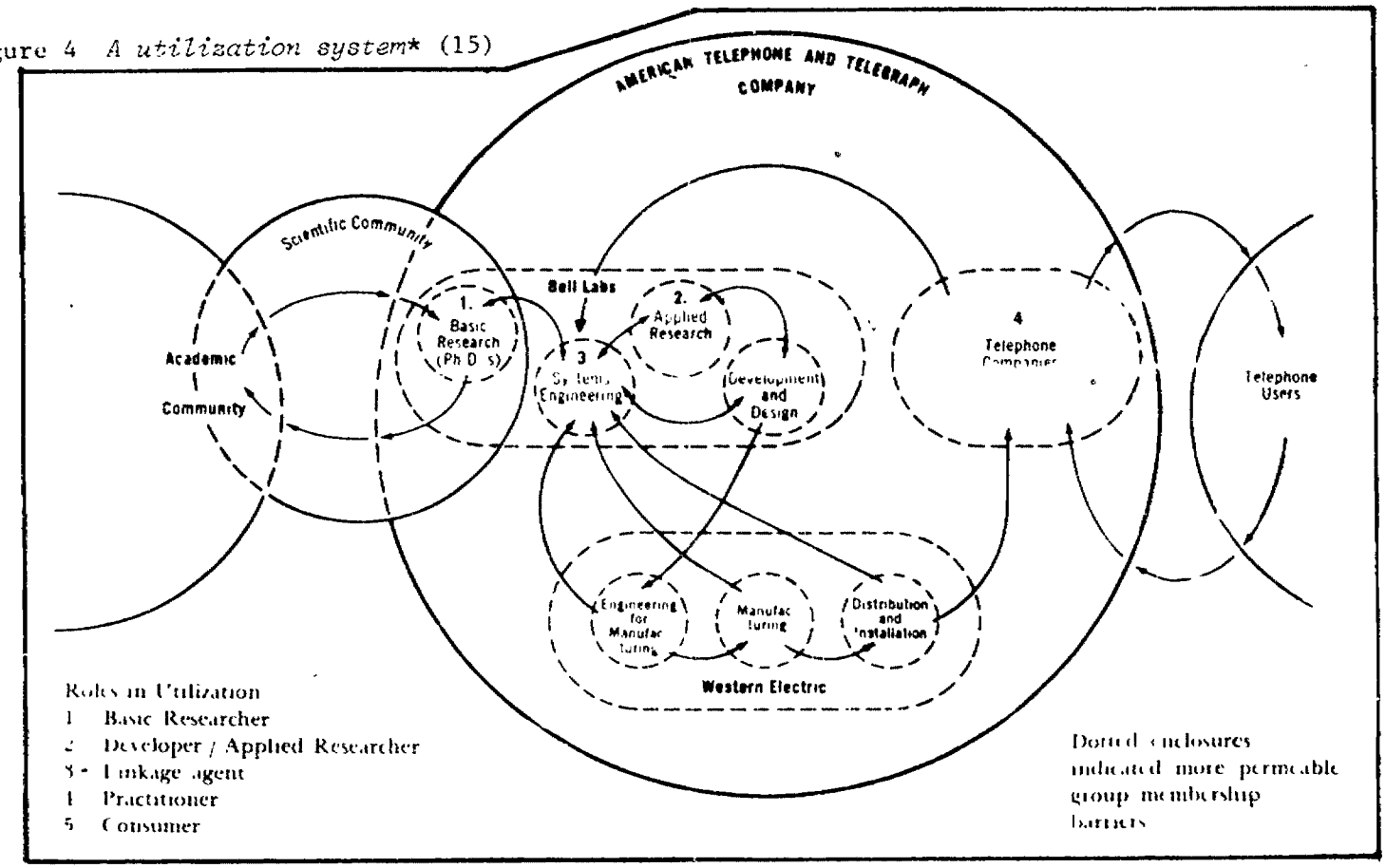


Figure 3 *Group membership barriers* (15)



This diagram illustrates the practitioner's resource access problem. The most qualified and appropriate resource may be relatively inaccessible because of group membership barriers.

Figure 4 *A utilization system** (15)



The above diagram outlines the knowledge utilization chain in a large corporation. Note especially the *linkage* role represented in this system by "systems engineering". Systems engineers are especially adept at deriving implications from basic research while leaving the basic researchers to pursue purely scientific interests without fear of company constraint.

*Constructed from information supplied by a participant in the utilization seminar and supplemented by material from Morton, J.A. "From Research to Technology", *International Science and Technology, May 1964.*

Concerning the administrative structure Havelock and Benne list

a) The educational structure providing for "the replenishment of the professionals, the maintenance of standards, and, above all, the preparation of consumers for the use of knowledge".

b) The financial support available for various projects, its reliability and stability that make possible long-range projects.

c) Control structures that have to specify goals, control their fulfilment etc.

d) Protection structure, i.e. gate-keeping functions to keep one group from encroaching on another, copyrighting, licensing etc.

e) The change or growth structure, i.e. the adaptability to new knowledge and new circumstances.

Concerning the EUDISED project, the concept of barriers in the system's flow structure seems to be important. The authors state in this respect that utilisation chains "are beset by two principal kinds of difficulties, the impermeability of barriers and the overloading of resource persons". The simplest chains, which involve only a few resource persons and hence few barriers are continuously in danger of overloading.... Complex chains which contain many resource persons in separately defined roles tend to reduce the pressure on any other member", however, "the addition of each member means that the information must flow through additional barriers". Persons serving as linkage agents will therefore be necessary.

As regards knowledge utlisation as a process, Havelock and Benne distinguish between (a) Motivational aspects, (b) Interpersonal and group membership issues, and (c) Technical issues.

With respect to motivational aspects, there are two kinds of motives: "motives which are based directly on consumer or client need and those which are not". Client needs are, of course, "the raison d'être of utilization. Yet it would be too much to expect that every role on the utilization chain is filled by someone who has the consumer's need always in mind." Some needs of consumers may be more visible than others, however, "what is visible may not be most important for either the short-run or long-run welfare of the individual".

Concerning interpersonal and group membership issues, factors "which seem to cause boundaries to be more or less permeable" were mentioned in the last paragraph. Among them the values and value orientations seemed to the authors of particular importance on the basis of their findings. "They help to define and to maintain the self-image of the individual chooser, the limits of his influenceability." The authors state that the "differential rates of diffusion may well be illuminated by clarifying the kinds of knowledge and technology which, if chosen, would threaten central values of the potential adopters and so release self- and group-maintenance operations against this new knowledge or technology".

Havelock and Benne in observing the problem "of how to develop trust and exchange between persons with different value orientations while respecting

the 'functionality' and 'reality' of these differences", refer to "linkage agents". They are "marginal men", existing "on the periphery of one discipline because of their connection with another. Yet these are the men who pass on information, who get it applied, who create the linkage." Havelock and Benne consider it "of the utmost importance... to understand their problems, and... come up with solutions... which will not only allow these people to carry on... but which will also attract ever-increasing numbers to take on similar roles in our society".

The technical aspect of the utilisation process has two phases, one of the preparation and one of the transmission of a message. Preparation of the message involves

a) assembly, bringing together the relevant facts

b) recoding the information "so that it is understandable and acceptable to the receiver"

c) screening, i.e. reviewing and re-evaluating the message "with respect to a number of criteria including safety, reliability, validity, error, relevancy, and redundancy"

d) titling or labelling the message, so that the receiver "should have a reasonably accurate expectation of the contents of the message and more especially the value the message may have for him".

Transmission of a message would involve decisions on the medium to be used:

a) writing/printed materials: advantages - accuracy, volume transmission, minimum of static. Disadvantages - "often slow, tends to be overloaded, and is ineffective for feedback".

b) mass media of television, radio and lectures to large audiences "have advantages over writing in that they provide speed, in presentation and distribution, but, like writing, they provide poor feedback channels, and they are highly prone to static".

c) "Face-to-face transmission within small groups of people provides the best feedback opportunity, but may be inefficient for mass dissemination."

d) comprehensive in-residence learning sessions are considered an "ideal vehicle for transmission of knowledge of a complex nature" providing the "receiver the opportunity to experience the new information, either through observing a demonstration or by trying out himself".

In concentrating on some other than the usual aspects of user needs and user studies, it was the intention of this section to emphasise the need for a more sophisticated and comprehensive approach. As we shall have to develop an interface of educational documentation and information services with users for the next two or three decades, this should be done - particularly in education where the majority of potential users of information are not researchers or deve opers - on a more appropriate basis.

5. EUDISED AS A COMPUTER-BASED KNOWLEDGE UTILISATION NETWORK

The mere description of a decentralised educational documentation and information network, of its elements and their functions presents a certain degree of arbitrariness. Therefore, the preceding sections were conceived as a frame of reference if not partly as a kind of rationale for the projected system. Thus when reference is made below to user studies in certain fields or by certain elements of the network, it will be obvious from section 4 that a more sophisticated kind of user study is implied. When we refer to "users" in general, it will be equally clear from section 2 that the term should be read to include potential users to a greater extent than is usually the case. Similarly, statements on the scope of educational documentation and information implicitly refer to section 3, as do those concerning technological trends to section 1. Moreover, it seems to be justifiable to base some tentative statements about EUDISED on the preceding sections; EUDISED should

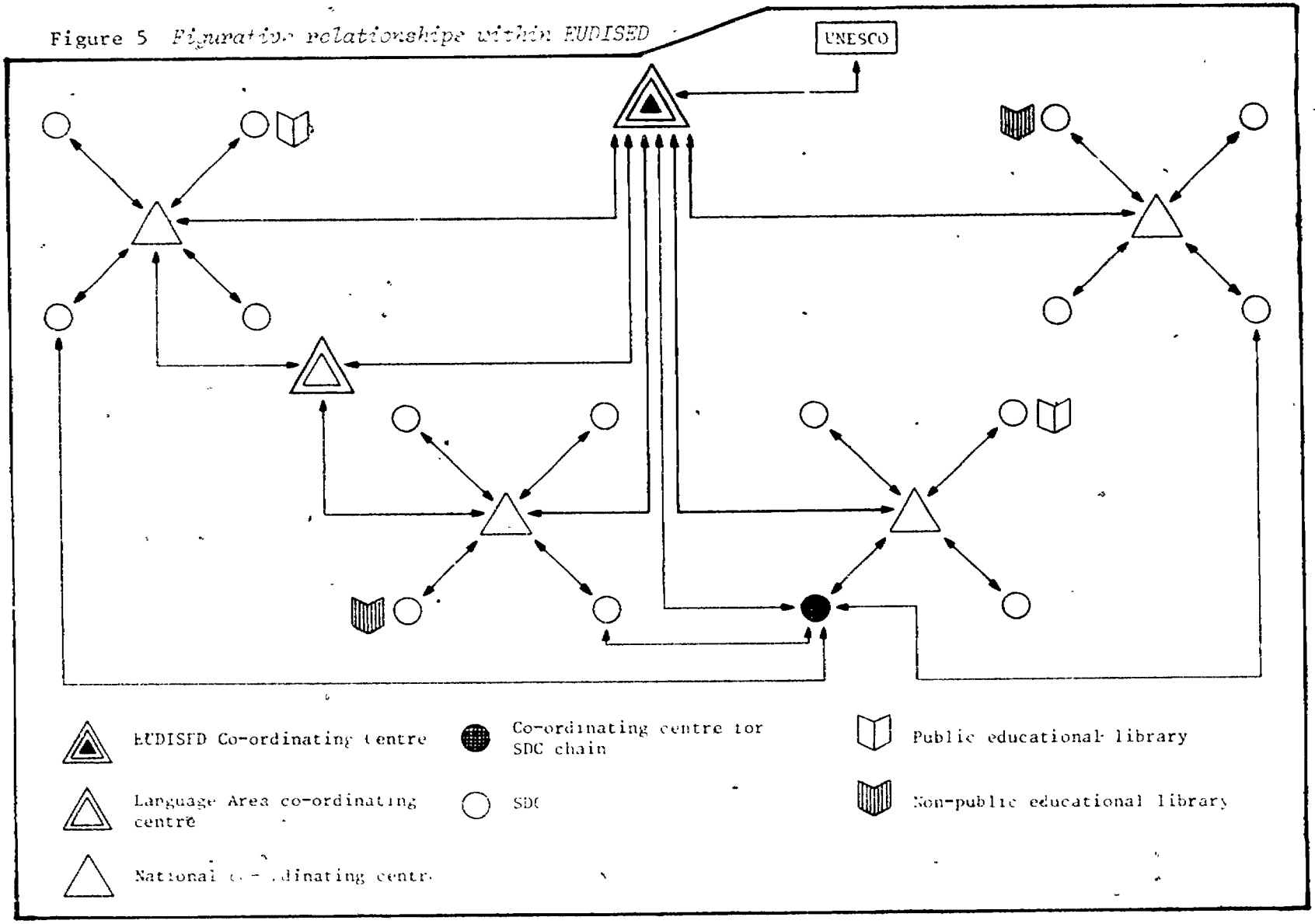
1. in its long-range perspective be conceived as a network of data terminals, consisting of several smaller interlinked systems
2. pay heed to developments in the processing and retrieval of full texts by computers
3. accept the total frame of reference for educational documentation and information tentatively described by the EUDISED Steering Group
4. serve directly or indirectly all parts of the education community, not just small segments of it
5. devise means to meet the needs of the education community, its potential users.

On the following pages an attempt will be made to specify some functions of the elements of the EUDISED system. The structure of the projected EUDISED system was described in the first EUDISED report (see Figure 5). The elements identified in this structure were: the EUDISED Co-ordinating Centre, the Language-Area Co-ordinating Centre, the National Co-ordinating Centre, the Specialised Documentation Centre, and chains of Specialised Documentation Centres with one of them taking the function of co-ordinating documentation and information in a particular chain.

There seems to be no new evidence in favour of replacing this structure by a new one. Such a move should wait at least until more detailed specifications of the functions of the system have been considered from the point of view of system design and until practical experience has been gained.

In the first EUDISED report the Working Party emphasised among the minimum requirements to be met by 1975 for the preparation of EUDISED the "further modernisation, expansion and reinforcement of national and language area documentation and information services" (16). Description of the functions of the system's elements will therefore start with the National Co-ordinating Centres, followed by Specialised Documentation Centres. (It is the function of these to co-ordinate efforts at regional level with one of them taking the role as a co-ordinator, but as this role will depend on

Figure 5 *Figurative relationships within EUDISED*



mutual agreements and particular decisions it will not be specified.) Short descriptions follow of the functions of Language-Area Co-ordinating Centres and of the EUDISED Co-ordinating Centre.

On the assumption that transfer of data over long distances will not become an economic possibility in the immediate future, the network concept - as far as remote access to resources is concerned - has been left out of present considerations. It might be a fair reflection of present trends to assume, however, that each element of the system will be able to handle some tapes, whether produced by itself or by other centres, if a computer-base for EUDISED is envisaged. The EUDISED Steering Group noted developments in this direction in several countries. It therefore seems possible to differentiate between the various elements of the system on the basis of the tapes they have available. In the following specifications "tape" can be taken to read "disc" or any other data carrier.

The functions of the elements will be broken down into five categories: A. General developmental and administrative functions, B. Special functions, C. Data bank (contents), D. Output, and E. Availability of full texts.

It must be stressed that the elements of EUDISED and their functions described on the following pages will be subject to modification in each member country of the Council for Cultural Co-operation to take into account organisational and economic patterns and feasibility of implementation approaches.

Functions of a National Co-ordinating Centre for educational documentation and information*

A. *General developmental and administrative functions*

1. Developing the national system for educational documentation and information concerning research, development and innovation, field experiments, planning and systems, statistics, teaching media and legislation and regulations.
2. Carrying through user studies and working out suggestions for the improvement of the national system of educational information.
3. Advising institutions venturing in the field of educational documentation and information in an attempt to co-ordinate efforts.
4. Organising the field of educational publications, e.g. by suggesting authors' abstracts.
5. Controlling the adaptation and observance of EUDISED exchange standards and other standards to secure and maintain a compatible system and make a division of labour possible among EUDISED partners.
6. Co-operating in the development of a national educational thesaurus as a national counterpart to a compatible EUDISED thesaurus and/or an international thesaurus.

* Depending on the national situation, certain of these functions may be carried out under the guidance of a National Committee.

7. Promoting specialised documentation and information on education.

8. Promoting the compilation and publication of state-of-the-art reports.

B. Social functions

1. Carrying out annual surveys on educational research and/or participating in surveys on research in the social sciences to extract data from these broader surveys for a specialised one on education.

2. Editing and/or promoting the publication of a national or language area bibliography on education.

3. Recording statistical data (diagrams, tables, nomographs etc.).

4. Maintaining records of educational institutions and their activities particularly in research and development.

C. Data Bank

1. Holding master tapes of

1.1 language area and/or national educational bibliography

1.2 statistical data

1.3 educational research

1.4 educational institutions

2. Holding duplicate tapes of

2.1 educational bibliographies of other countries and areas

2.2 specialised educational documentation projects of the area or country

2.3 research inventories of the area or country

2.4 research inventories of other countries or areas, e.g. ERIC

3. Arranging with other centres for access to tapes of

3.1 the relevant national or language area bibliography

3.2 relevant documentation projects existing in other fields, e.g. MEDLARS, Psychological Abstracts etc.

D. Output

The output of the National Co-ordinating Centre depends on

a) the volume of accessible resources (see: Data Bank)

b) the kind of resources, e.g. bibliographical data, abstracts (ERIC), state-of-the-art reports, full texts etc.

c) strategies adopted to secure optimal utilisation of information resources (see section 4)

d) technical feasibility, and

e) economic considerations

Each national system will therefore have to develop its own plan to promote optimal knowledge utilisation among various target groups of potential users. Technically the following possibilities exist for presenting information

a) in listed form

b) on library cards

c) on duplicate tapes

d) via terminals

Furthermore, along the time perspective there could be

a) [illegible] answers to requests (searches)

b) quasi-immediate information dissemination according to interest profiles (SDI)

c) direct search operations via terminals, and

d) information pre-packaged in anticipation of needs

To avoid duplication of work on bibliographic descriptions by many educational libraries, some national planning of educational documentation and information might be considered to provide the libraries with library cards on the basis of available data banks. Tape copies would not be of service to them for some while.

E. [illegible]

The National Co-ordinating Centre for educational documentation and information should only be collecting secondary educational publications, e.g. bibliographies, reference books, directories of institutions and their activities in the country or area. A selection of secondary publications from other countries should also be available. Microfiches distributed by certain other services, e.g. ERIC, might also be held at the Centre and made available via mimeographing facilities on special request.

Whether tertiary publications (state-of-the-art reports etc.) and their compilation should be physically handled by the Centre, will depend on considerations of feasibility.

It might be advisable to consider holding special collections of innovation and development projects and of field experiments at the National Centre on microfiches. These are documents that will rarely be printed but are of great value for other similar projects for at least two to four years of development, if not longer.

Whether research reports can be put on microfiches needs some thought. In contrast to American research reports, European ones tend to be of

greater length, often running to a couple of hundred pages. As many of these reports will be published only as "grey literature" however, recording them on microfiches, though costly, will be cheaper than printing and will make them available.

As long as full texts are not available on computers - and this will be the case for some time to come - the availability of documents quoted in secondary publications will have to be the concern of all centres co-operating in the EUDISED system. Arrangements for reducing the frustrations of potential readers of documents quoted should be considered by all co-ordinating centres in conjunction with the library system in each country or area.

Functions of a Specialised Documentation Centre

A. *General developmental and administrative functions*

1. Co-ordinating educational documentation and information within a specialist field, e.g. teaching media, foreign language teaching etc.
2. Carrying out user studies to improve habits of knowledge utilisation.
3. Adapting and observing EUDISED exchange standards and other standards to facilitate compatibility.
4. Co-operating in documentary work with similar centres in other countries or areas to avoid duplication of effort.

B. *Special functions*

1. Developing a thesaurus for the specialist field as part of a macro-thesaurus on education.
2. Aligning this thesaurus with specialist field thesauri of other countries.
3. Analysing documents and materials relevant to the field.
4. Editing and publishing thematic or periodic bibliographies.
5. Selecting state-of-the-art reports and promoting their production.
6. Selecting titles from the specialist field publications for use in the national bibliography or as survey materials in bibliographies of Special Documentation Centres of other countries.
7. Using the resources of the national educational bibliography by extracting titles (scattered literature) from general educational literature contained therein.
8. Keeping track of research and developments, field experiments and innovations in the field.
9. Keeping track of institutional data relevant to the field.

C. *Data Bank*

1. Holding master tapes of documents and materials relevant to the field in the country or area.

2. Holding duplicate tapes of similar documentation projects in other countries.

D. *Output*

The points listed for the output of the National Co-ordinating Centre will also apply to decisions of the SDC. Co-ordinating agreements among SDCs of different countries on output might be possible and labour saving.

E. *Availability of full texts*

The SDC should try to maintain a collection of secondary publications as well as of primary literature on research, field experiments and innovations in its own field.

Functions of centres co-ordinating chains of Specialised Documentation Centres

The functions of Specialised Documentation Centres listed above indicate many areas for co-ordination and division of labour. There seems to be a wide variety, though, of types of co-ordination:

1. An already well established Specialised Documentation Centre in one country - with no parallel centres in others - may add additional data from contributors and/or contributing agencies in those other countries to its documentation of the field, to make it more comprehensive.

   This type of co-ordination might lead to Specialised Documentation Centres being set up in other countries or at least it would result in improved surveys of the field concerned being enjoyed by the education community of many countries.

2. Co-operation of already existing and equivalent Specialised Centres of several countries co-ordinated in a chain by one of them.

   This type of co-ordination could result in

   a) a division of labour, concentrating the work of each co-operating centre

   b) contraction of all centres other than the co-ordinating centre.

3. Co-ordination initiated by the EUDISED Co-ordinating Centre, e.g. by the Council of Europe, or similar initiatives based on *ad hoc* priorities in educational research, development and innovation for which no specific existing documentation activities are apparent.

Depending on the insight of decision-makers, funding agencies, foundations etc. attempts at co-ordination could either improve the EUDISED system or harm it. Any co-ordination approach would therefore have to be examined in the light of its likely consequences.

Functions of the Language-Area Co-ordinating Centre

The functions of a Language-Area Co-ordinating Centre would be similar to those of National Co-ordinating Centres. As the developmental and administrative costs of educational documentation and information will primarily be borne by individual member countries of the Council of Europe, language-area activities might have to depend on National Centres with a steering committee in a co-ordinating capacity. Depending on the decisions such a committee may take, one of the National Centres might be charged with the practical implementation of the planning, or the National Centres might share the implementation effort according to an overall plan.

Functions of the EUDISED Co-ordinating Centre

A. *General developmental and administrative functions*

1. Developing EUDISED as a decentralised but comprehensive educational documentation and information system according to the frame of reference tentatively described by the EUDISED Steering Group.
2. Considering EUDISED as a regional educational documentation and information system within an emerging international one and representing it in the relevant organisations and bodies.
3. Trying to organise the international field of educational documentation and information by achieving a division of labour between EUDISED and documentation projects of international organisations neighbouring the field of education. Trying in particular to request these organisations to keep track of their own publications, reports etc. and preparing lists of tapes to be fed into the EUDISED system.
4. Carrying through network studies.
5. Carrying through experiments with new organisational and technological approaches to improve the utilisation of knowledge capacity of EUDISED.

B. *Special functions*

1. Publishing analyses of educational research and development in Europe.
2. Promoting the development of alignment of educational terms used in different languages in an attempt ultimately to develop a thesaurus of education terms applicable within the EUDISED system, in co-ordination with the efforts of UNESCO/IBE.
3. Publishing thematic bibliographies according to priorities set by common European educational trends and projects.

4. Helping to co-ordinate chains of Specialised Documentation Centres.

5. Developing standards for the EUDISED system to introduce and maintain compatibility.

C. *Data Bank*

1. Holding or having access to duplicate tapes of the output of international organisations in the field of education.

2. Holding duplicate tapes of

2.1 national or area educational bibliographies

2.2 national or area inventories of research

2.3 Specialised Documentation Centres or chains of centres within EUDISED

2.4 research inventories of countries and areas beyond EUDISED

2.5 state-of-the-art reports

D. *Output*

The co-ordinating activities of the EUDISED Centre should be communicated in special sections of the *Information Bulletin* and other publications e.g. *EUDISED NEWS*. The same points on output as were listed for the National Centres would be applicable to the EUDISED Co-ordinating Centre.

E. *Availability of full texts*

The EUDISED Co-ordinating Centre should primarily have full texts of secondary publications, of tertiary publications, and of microfiches accompanying research inventories.

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(4) *Educational Periodicals.* Paris: UNESCO, 1963.

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(8) Figure 1 was taken from: Garvin, Paul L. *Specialty trends in the language sciences.* Washington, D.C.: Center for Applied Linguistics, December 1969.

(9) *cf.* Robert, A. Hood *The system of communication in the language sciences: present and future.* Washington, D.C.: Center for Applied Linguistics, Oct. 1969.

(10) *EUDISED, Vol. I*, p. 48.

(11) Ebersole, p. 6.

(12) Steinbuch, Karl "Hat das Buch noch eine Zukunft? Der Medienverbund von morgen - informationstheoretisch betrachtet", in *Die Welt*, 3.4.1971.

(13) *cf.* Benne, Kenneth D.; Chin, Robert and Bennis, Warren G. "Science and practice". In: Bennis, Warren G.; Benne, Kenneth D. and Chin, Robert *The Planning of Change.* New York etc.: Holt, Rinehart and Winston, Inc. 1969, pp. 113-123 and Lippitt, Ronald "The Process of Utilization of Social Research to Improve Social Practice", *ibid.* pp. 142-146.

(14) *cf.* ref. no. 6.

(15) The figures were taken from the article by Havelock and Benne.

(16) *EUDISED, Vol. I*, p. 33.

	A. Research	B. Development, Innovation	C. Field Experiments	D. Planning, Systems	E. Statistics	F. Teaching Media	G. Legislation, Decrees
100 Education (General)							
200 Institutions and fields							
201 Family							
202 Teacher							
203 Pre-school education							
204 Primary education							
205 Secondary education							
206 Higher education							
207 Vocational and Technical education							
208 Adult education							
209 Special education, rehabilitation							
210 Social work							
211 Youth work							
212 Leisure							
300 Technology, Teaching methods							
301 Facilities and equipment (including premises)							
302 Individualised teaching							
303 Group work							

	A. Research	B. Development, Innovation	C. Field Experiments	D. Planning, Systems	E. Statistics	F. Teaching Media	G. Legislation, Decrees
304 Teaching by correspondence							
305 Audio-visual media							
306 Programmed education							
307 Computer-assisted teaching							
308 Tests							
309 Examinations (including competitive examinations). Docimology							
310 Apprenticeship							
400 Curricula and syllabuses							
500 Subjects taught							
501 Art							
502 Domestic economy							
503 Physical training							
504 Religious education							
505 Sexual education							
506 Commercial education							
507 Geography							
508 History							
509 Mother tongue							
510 Foreign languages							

	A. Research	B. Development, Innovation	C. Field Experiments	D. Planning, Systems	E. Statistics	F. Teaching Media	G. Legislation, Decrees
511 Mathematics							
512 Medicine							
513 Exact and natural sciences							
514 Social sciences							
515 Secretarial work, typewriting							
516 Metal work, woodwork etc.							
600 The individual and the community							
601 Personality development							
602 Socialisation							
603 Society							
604 Social change							
605 Futurology							
700 Educational planning and policy							
701 Demand for education							
702 Educational economics							
703 Educational policy							
704 Educational planning							