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ABSTRACT

A conference examined the socioeconomic challenges of technological and educational change throughout the European community. One hundred fifty representatives from a cross section of countries and agencies involved in education, training, and employment gathered to discuss the following themes: the transition from initial training to employment with specific reference to the new technologies and the need for vocational education; training needs of management, employers, and employees in regard to new technologies; information technology and a changing society; and polarization or depolarization of qualification structures. The following were the main conclusions of the conference. Qualifications are not directly and narrowly determined by technical innovation. The relationship between present and future job contents and training is indirect and complex, and a new relationship between education and training is needed to master skills in a future job. Although they may be unaware of it, politicians, trade unions, and employers play an important role in exercising choices shaping education and training arrangements and technological change. The considerable need for adult training and retraining has made consideration of new training methods an urgent matter. Small and medium-sized enterprises are faced with special problems, including greater difficulties in administering systematic training, and often a lower capacity for technical innovation. (MN)

Techno[illegible]ment, qualific[illegible]

CEDEFOP

CEDEFOP

A development of concepts from a conference held in Berlin, 24-26 November 1982
jointly organized by the Commission of the European Communities and Cedefop —European Centre for the Development of Vocational Training

This report was written by
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1. INTRODUCTION

1.1 Purposes and organisation of conference and report

The conference on "Technological change, employment, qualifications and training" was jointly organised by CEDEFOP, the European Centre for the Development of Vocational Training, and the Commission of the European Community, Directorate General V (Employment, social affairs, education). It took place in the Reichstag in Berlin, from November 24-26, 1982. The author does not only report, here, in the conventional sense of a report but has also extracted, analysed, ordered, synthesized and discussed within a general framework, all the written and oral contributions to the conference. These include plenary papers, papers for working groups, written reports on group activities, together with their presentation and all other oral contributions.

To be able to interpret contributions within the general development of work in European bodies on the subject, the author took part in preparatory meetings for the conference. The brief also included smaller reports on the discussion in two CEDEFOP meetings which led up to the conference. The meetings were:

- A seminar on "Microelectronics and Informatics Technology and its Training Implications", held in Berlin, June 10-11, 1982.
- A seminar on "Curriculum Changes in Response to Technological Developments", held in Berlin, May 25-26, 1982.

Before these meetings, there had already been some collaboration between CEDEFOP and the author, notably for the organisation of a conference on "New technology, Manpower and Training"

in Berlin, December 9-11, 1981. This was jointly organised by the International Institute of Management, Labour Market Policy Unit (Wissenschaftszentrum Berlin) and CEDEFOP. All these meetings were smaller-scale and directed at research or vocational training specialists. They were useful as a preparation of the larger conference which is to be discussed in the present report. In addition to his collaboration with CEDEFOP, the author had also acted as a consultant to the Commission, Dir.Gen. V, in administering a questionnaire in the member countries and interpreting and writing up the results of the survey. This led to a paper on "Microelectronics and Vocational Education and Training" which became available from the Commission, Dir.Gen. V, as well as from the Wissenschaftszentrum Berlin (1).

Meetings and seminars prior to the conference generated ideas about its general purpose and format. These were developed further, in consultation with various bodies and personalities within the EC/CEDEFOP or linked with them, into a conference scheme. The intention was to bring together experts from all the member countries and the EC services, to discuss the issues raised by the theme of the conference, in order to generate a common perspective to guide further reflection about such issues in the member countries and in the EC services. Invited experts came from national or governmental bodies in the fields of vocational training, education and employment, corresponding functions of enterprises or organisations of the social partners, research, and EC services. The latter term is used, in this report, to refer to Dir.-Gen. V and CEDEFOP in particular.

About 150 participants attended the conference, making up a representative cross-section of countries, bodies involved in the education, training or employment tripartism, and EC

(1) Discussion paper IIM-LMP 81-14.

services. After a welcome from Senator Kunz (Berlin finance senator in charge of European matters), and after the speech by Hywel C. Jones (Dir.-Gen. V, C), the conference began its first morning with introductory general papers. These were given by P.-P. Valli (Centre d'Etudes et de Recherches sur les Qualifications, CEREQ, France), G. Holland, represented ty J. Wiltshire (Manpower Services Commission, MSC, UK) and H. Schmidt (Bundesinstitut für Berufsbildung, BIBB, Fed.Rep. of Germany).

Ideas and suggestions from the morning were taken up in the afternoon discussion. First, there was a panel discussion led by H.C. Jones, which then broadened out into a plenary discussion. The participants in the penal discussion were the three introductory speakers, as well as authors of introductory papers for specific working groups meeting on the second day of the conference. Via the mechanism of subsequent introductory speeches, panel discussion and plenary discussion, as rich variety of views and contributions was generated.

Having stimulated this variety, the conference organisation channelled it into four separate working group meetings which took place during the entire second day. These were organised so that there was one person to present an introductory paper on the theme of the working-group, a president and a rapporteur. These had again been selected so as to maintain an even spread across countries and representative bodies (unions, employers, governments, etc.). Group organisation is indicated by the tabular scheme under this heading which the reader is asked to refer to. Those who gave papers had also been involved in the panel discussion of the previous day. Group activities took a full day in order to allow the mayimum involvement of every participant and the development of common views which were as representative as possible. In the evening, rapporteurs prepared a report for each group which was immediately translated

into most EC languages. Group reports went to P.-P. Valli, rapporteur-général of the conference, who based his final report on them.

GROUP ORGANISATION

Group	Theme	Paper by:	President	Rapporteur
I	The transition from initial training to employment with specific reference to the new technologies: the need for vocational education	A. d'Iribarne, Laboratoire d'Economie et de sociologie du travail (CNRS), Aix-en-Provence, F	A.H. Koelink, Ministerie van Onderwijs en Wetenschappen, s'Gravenhaage, NL	B. Lutz, Institut für sozialwissenschaftliche Forschung, München, D
II	Training needs of management, employers and employees' representatives in regard to new technologies	A.W.C. van Kemenade, Adviesgroep voor Analyse Planning & Management, Vessem, NL	H. Brumhard, Kuratorium der deutschen Wirtschaft für Berufsbildung, Bonn, D	L. Valbjørn, Arbejdsdirektoratet, København, DK
III	Information technology and a changing society. The role of broadcasting in Britain	D. Allen, BBC Computer Literacy Project, GB	J. Evans,* European Trade Union Institute Bruxelles, B	S. Bruno, Università degli Studi di Roma/CGIL, Roma, I
IV	Polarisation or de-polarisation of qualification structures?	A. Sorge, Wissenschaftszentrum Berlin, D	P. Garonna, Univ. Padua/UIL, Roma, I	P. Debaty, Office National de l'Emploi, Bruxelles, B

* Nationality: GB

During the morning of the third and last day, group reports were presented and discussed, first. With R. Faist, director of CEDEFOP, in the chair, the conference then heard and discussed Mr. Valli's report with results and conclusions. Its discussion led on to closing speeches by Mr. Faist and A. Hughes, chef de cabinet representing Commissioner I. Richard.

All the papers, for plenary as well as group introduction speeches, had been sent to participants in their own language well before the conference. Group reports were swiftly translated and distributed. This, and the overall efficiency of conference organisation, created good conditions for developing a representative picture of views on the issues dealt with. This was what the structure and plan of work of the conference were meant to promote, and in this respect it was a success.

Representativeness with regard to a rich variety of views is, however, not necessarily gratifying to all individual participants. In the face of heterogeneity of views and different interests and emphases, discussion was often difficult. The conference certainly did not provide a conceptual breakthrough or establish a consensus of all interest groups and member countries. But this could not be expected of it. It did, however, reflect the variety of thinking in the member countries about issues addressed, and it helped, to some extent, to develop it further. Therefore, it was a useful event from two points of view: Discussion in the member countries was stimulated from an internationally comparative perspective, and EC services were put in a better position to develop their own activities in view of experience and suggestions from the member countries.

Conference proceedings have to be looked at in a long-term European perspective. This has to be based on past activities of CEDEFOP and the Commission, notably Dir.-Gen. V, as well

as on a projection of possible future activities. The task of this report is to demonstrate and interpret this continuity within a summary of public and specialised discussion about the issues mentioned in the title of the conference. The structure of subsequent sections of the report is derived from this goal; it will be as follows:

1) Central conclusions of the conference as they were presented in the final session by Paul-Pierre Valli, rapporteur général and one of the three plenary speakers, are repeated and discussed.

2) Links between the problems of technical change, employment, qualifications and training are discussed in greater detail. This serves to generate a general framework for dealing with the issues under discussion, and to derive a number of statements about relationships between the factors involved.

3) Following on from an outline of the problems, orientation for vocational training are derived in such a way as to reflect a meaningful and consistent view of conference results which may serve as a point of departure for thinking about further action, notably at the European level.

4) General conclusions of the conference are drawn at the end; they represent a less detailed summary of what was said previously and place recent and possible policy and study initiatives within the perspective developed in the previous sections.

The report was compiled in awareness of recent EC documents.

- The draft resolution of the Council on vocational training policy of the EC during the 80s (Com (82) 637), and
- a communication to the Council on "Vocational training and new information technology: New initiatives of the Community for 1983-1987" (Com (82) 296).

They are not discussed in depth, but implications of the conference which have a bearing on their respective contents are suggested.

1.2 Conclusions of the rapporteur général

Towards the end of the conference, the rapporteur général gave a summary of the main points of discussion which emerged. They were presented as a list of five points which is summarised here. It is important not to consider this list as a catalogue of independent points. Instead, it is a step-by-step argument where each successive step depends at least partly on the previous one. First, the five points will be sketched out briefly, and then, their underlying logic will be explained. In order to prevent misunderstanding, a remark is needed to clarify the use of the notion of "qualification" in this text and in the conference: English speakers tend to see "qualifications" as paper qualifications or certificates, including certificates of doubtful value. This is not the meaning implied here. The term is used to denote real skills, competences or knowledge. The five main points were:

1) There is no absolute technical determinism. Qualifications are not directly and narrowly determined by technical innovation. There is, therefore, leeway for the exercise of choice. Such choice depends on the behaviour of actors, on political events, and on the socio-economic environment in which technical change occurs.

2) The relationship between job contents - present day and even more future ones - and training is indirect and complex. It is impossible to anticipate future job contents, precisely, in training. A new relationship between education and training is therefore needed, to master skills in a future job.

3) Actors of different kinds, - politicians, trade unions, employers - play an important role in exercising choice, which fashions education and training arrangements and technical change. Yet, they are often unaware of this role. Awareness of it should be encouraged, and they should use their role consciously.

4) There is a considerable need for adult training and re-training, in view of the rapidity of change and the large numbers of people who may be affected without having received sufficient basic vocational training. The gravity of the problem makes it necessary to consider new training methods, for instance the use of public media.

5) Particular adaptation is required in some sectors with particular chararteristics, notably in small and medium-sized enterprises. These have a specific social climate, greater difficulties in administering systematic training, and often a lower capacity for technical innovation.

These five points reflect important and rather well accepted arguments made throughout the conference. They are logically linked in the following way: Technical non-determinism is the point of departure. Its significance is explored, in greater detail, in section 2.2. Technical change does not lead to training requirements in a deterministic fashion because its implications for job contents are indirect, and there is further ambiguity in the relationships between job contents and training arrangements, as pointed out in the second conclusion above. The emphasis on the responsibility of the policy-makers and practitioners follows from these conclusions.

Training can only be useful if it is geared to perceived practical problems. However, this does not mean that it should have a short-term objectives in order to be seen to be effective. Problem areas are mentioned in points 4) and 5) above. Now, in line with arguments following on from the notion of non-

determinism, these should not be tackled under the assumption that short-term rapid adaptation courses yield satisfactory results. Adaptation to jobs which are vacant or whose task profile is rigidly determined is a very limited concept. The most pressing problem, unemployment, means that jobs have to be created whose profile still has to be determined, that the generation of broad-based skills has to be at least partly independent of precise job profiles, and that existing qualification shortages concern aptitudes which are not generated through short-term measures. A central point in a sensible training initiative has to be that it must aim at the mastering of new technology. It should trigger off the development of productive forces in order to produce jobs and employment rather than merely adapting people to a quantitatively limited number of vacancies.

Such considerations, forming a logical backbone behind the five points mentioned at the beginning, express the basic message of the conference. Monsieur Valli then went on to develop a number of issues which had been raised and which were a cause for further reflection. They needed attention beyond what the conference was able to contribute, and he suggested a way of thinking about the issues in the hope of leading on towards the solution of those problems which they imply. Such issues are not developed in detail, in this section of the report, but in chapters 2 and 3. These chapters already contain ideas for further reflection which were taken up, developed and integrated into the further analysis of conference proceedings by the author.

The remarks of the rapporteur général served to illustrate the necessity of further conceptual development and detailed comparative work, with reference to conference proceedings. This is why it was appropriate to write a conference report

which was already a first step towards this objective. The following sections of the present report therefore take up the points made by the rapporteur général and make some reflections on the basis of contributions to the conference, which was not possible for him to do during the night between the end of group sessions and the final plenary meeting. These are offered as a help to steer in a course between what will be analysed, towards the end of the report, as the Scylla of sweeping generalisations and the Charybdis of individualised fact-mongering.

2. OUTLINE OF PROBLEMS

The conference addressed its theme in the broadest possible way. Although this was inevitably linked with some problems of understanding between different kinds of participants, it was necessary in order to arrive at a more comprehensive view of the subject area. this helps to define more specific fields of activities for the future, without losing a general sense of direction. In this chapter, common definitions of the problem as they present themselves in retrospect are analysed. This serves to enlarge the perspective adopted in the central conclusions presented by the rapporteur général.

2.1 Heterogeneity of technical change

Much of the time participants talked about "the new technology" as if this expression was of any great use on a purely technical level. One might argue that discussions in fact dealt with a phenomenon much more heterogeneous than might be indicated by such a term. The problem about microelectronics is that in the course of its further development and diffusion, it is constantly changing and being adapted to increasing applications in products and processes, so that the observer is confronted with a great number of techniques or technologies rather than "the" technology. To go on talking about "the"

technology therefore is increasingly akin to the building of the tower of Babel and the concomitant language confusion.

To distinguish the technical points of concern of the conference more clearly, one may break down the area of microelectronics and its applications into components which may be more homogeneous and afford a more precise discussion of their respective vocational training aspects. A first distinction has to reflect stages of diffusion and application. At the first stage, one may deal with microelectronic components and circuits per se. At the second stage, these are integrated into computers and control equipment of different kinds. This area encompasses general-purpose and specialised mainframe and minicomputers, computer numerical control systems, programmable control devices, memory and control parts of communication and information equipment, and similar applications of electronic components within an information, communication or control device.

At the next stage of diffusion, microelectronics can be considered as part of information and communication equipment in a wider sense. This includes not only electronic computing and control equipment, but also very complex and demanding interfaces with non-electronic equipment and processes. Such interfaces include visual display terminals, data entry and output devices (keyboards, printers, sound or graphic recognition), sensors, transducers, information transmission, and others. This stage already features a high degree of differentiation of applications. It may be noted how this differentiation increases with the stage of diffusion of microelectronics into a growing number of applications. Hence, because the basic electronic components fit into an increasingly differentiated and broadening range of equipment and processes, they become part of different technical environments which render a discussion of "the" technology meaningless.

This applies particularly as one moves to the next stage of diffusion, where microelectronics is corsidered as part of applications beyond the pure information and communication fields, but in which electronic control and information-processing has come to play a larger role. This includes computer numerically controlled machine-tools of different kinds, industrial warehousing and automated feeding and transport systems, household appliances, chemical plant, medical equipment; the list is potentially unlimited. At this level of diffusion and differentiation, it is impossible to discuss vocational training aspects of "the" technology.

In addition to the distinction between stages of diffusion, it is important to distinguish between microelectronic applications in products and in processes. Microelectronics may be used as part of the product which a process of work leads to. This is different from its utilisation as part the tools used to accomplish the process of work. Again it appears important to make this distinction because it bears on the discussion of vocational training for differert groups: the situation has to be viewed differently for those who manufacture as against those who use particular equipment.

A last distinction to be made at this point opposes the concern with equipment or hardware aspects to that with regard to software. In the case of the hardware concern, more electronic knowledge and skills are essential, whereas in the case of concern with software, knowledge and skills focus more on data-processing and programming languages.

If we now combine these distinctions, a three-dimensional typology is the result. This is represented graphically, in the following scheme "Microelectronics and their applications in a spheric representation of areas of development" which shows the combination of distinctions in the shape of a pyramid.

This choice was deliberate to visualise the "broadening-out" of differentiated applications as one moves through stages of diffusion. The scheme takes up the differentiations made above, that is,

- stages of diffusion and application,
- product-process, and
- equipment/hardware-software.

The vast range of microelectronics and its applications is thus visualised as parts of a large pyramid. Electronic components themselves come at the less voluminous tip of the pyramid. Then, as one decends the pyramid and parts become more voluminous, one gets to the manifold applications, first in computers and control equipment, then to information/communication equipment which contains such computing devices, and at the bottom of the pyramid, other equipment which in turn contains computing, control, information or communication devices. Every vertical slice of the pyramid is further divided into product - process and equipment - software parts. Thus, as one goes from top to bottom, one moves from "pure" electronics to instrumentalised electronics as part of different products and processes, with their own respective equipment and software development problems. The variety of different problems is pictured by the increasing size of pyramid parts from top to bottom.

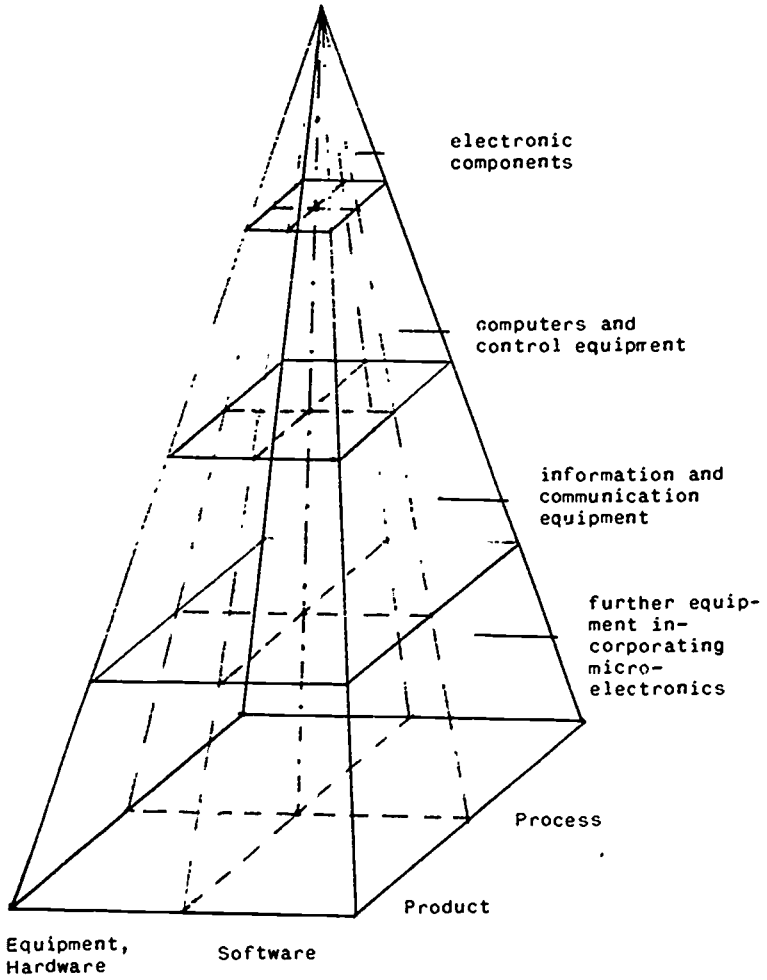
MICROELECTRONICS AND THEIR APPLICATIONS IN A SPHERIC REPRESENTATION OF AREAS OF DEVELOPMENT

_____ contours and vertical segments

_ _ _ _ middle lines in horizontal surfaces

_ . _ . _ central axis

___ ___ ___ middle lines of side surfaces



The message behind the scheme thus is that any discussion of vocational training aspects has to bear in mind the increasing differentiation of the field, to avoid a language confusion between experts in respective specialised fields of application. This is particularly important in fairly "practical" discussions of vocational training focussing on methods, contents, and learning instruments for training courses. This may be illustrated by some examples. Training requirements for someone who takes part in designing the architecture of a new microcomputer (second slice of the pyramid from the top, product-equipment section) are one thing. Another thing is training for someone who does work planning and programming for CNC machines (bottom slice of the pyramid, process-software section).

All this is not to say that sections of the pyramid should be identified with homogeneous training requirements. Ont the contrary, the larger the slice of the pyramid, the more differentiated can vocational backgrounds within each section be imagined to be. Any further discussion of microelectronics will thus have to bear in mind that, as microelectronics is increasingly diffused, it has to be dealt with in such a way as to take account of increasing vocational differentiation of those who are concerned by it. Thus, already a discussion limited to "simple" practical ideas about a proper training response to microelectronics quickly becomes highly complex. This is one, difficult, entry into the range of problems dealt with by the conference.

2.2 Technical non-determinism

It was mentioned, in the summary of the rapporteur's main conclusions, that the notion of technical non determinism was a corner-stone of the conference. As such, it deserves

closer analysis. After the heterogeneity of technical change was shown above, this is the next logical step in the exploration of the relationship between technology and vocational training. Heterogeneity and non-determinism are key concepts in a demonstration of the complexity of this relationship.

The significance of technical non-determinism is quite simple, but often misunderstood. It does not mean that technical properties are of no consequence for work organisation, training arrangements, the composition of skills, and other factors. It does mean, however, that the socio-economic context impinges on the development, selection and application of technology just as much as the other way round. Technology is not autonomously given but developed to suit socio-economic purposes. Technical and socio-economic arrangements, including training and qualification structures, thus determine each other. Reciprocal determination then means that outcomes are ambiguous. Again, this is not to say that "anything goes". It is not sufficient, either, to characterise determinism as ambiguous because of accidental variation alone.

Instead, it is important to note that reciprocal determination means that in a general expression of relationships, there is no distinction between independent and dependent variables. This does not preclude the existence of discernible relationships. The effect of technology on socio-economic arrangements can, however, not be described if the inverse effect is not known. To characterise the relationship between technology and other factors thus means entering into the consideration of an infinite regression. This cannot be fully apprehended in a rational discourse. Hence, although there is an infinite process of reciprocal determination, every rational picture of such relationships has to curtail this process artificially. The consequence is that a rational picture has to reflect an element of non-determinism.

Coming back from philosophical considerations to the concrete world of training and qualifications, the argument about non-determinism does not imply that certain aptitudes and experience cannot be shown to be essential for the generation and use of techniques. Instead, non-determinism refers to questions such as:

1) Who should be trained?
2) Where should training be given, in which way and over which period of time?
3) Which precise jobs are affected?
4) Do career patterns, modes of organisation and job contents have to be re-arranged, and if so, in what way?
5) In which direction should product and process development be stimulated, and what are the appropriate organisation and training patterns to make this possible and to respond to it?

Although this is only a brief and non-specific list of questions, it can be seen that the argument about non-determinism necessarily leads to increased awareness about the responsibility of employers, trade unions, training bodies, and different governmental institutions. The questions mentioned show the need for choice, and choice implies increased responsibility. Thus, point 1) takes us straight into point 2) and 3). Awareness of non-determinism thus leads to the exploration of alternative courses of action, in which the links between technical, training, skills, organisational and employment aspects have to be dealt with. Such links are still not precisely defined. The future appears <u>open</u> because choice is real in view of non-determinism. It is also <u>uncertain</u> because so little is known about the afore-mentioned links between technology and other factors.

The concept of non-determinism is important and meaningful within tne normal everyday concerns of people engaged in training activities on the one hand and company policy, labour and output markets trends, as well as a range of further factors on the other. It appears important to promote this kind of awareness. This will not only improve the orientation and responsibility of people concerned with training, but also the attention paid to training problems by decision-makers more generally. It would strengthen a perspective within which training is not merely seen as an adaptive mechanism with regard to technical, economic, or company policy determinisms. Worthwhile training is, instead, that which generates the capacity to conduct technical change as a socially and economically useful pursuit.

2.3 Change in education and training systems

The theme of the conference should not only be approached from the technical side. this is a further implication of the concept of non-determinism. Another point of entry is via the analysis of the existing institutionalised systems of vocational training. This is equally complex. Here the question would be: Which changes in the existing system of education and training are in order, to facilitate a diffusion of new technology which is compatible with desired socio-economic objectives? Such objectives span a very broad range of concerns. This stretches from the promotion of economic growth, reduction of unemployment, to improved integration of young people into the labour force. A more detailed analysis will follow later in the report. The question serves as another point of departure from which to order various contributions made during the conference and make it possible to deal with them more systematically.

To start with, a crude distinction of four major areas in the overall field of education and training may be used. The classification goes beyond the narrower vocational training field, in order to explore implications arising in and for other educational areas. First, there is a system of general education in place in every member country which does not lead to specific employment openings. Next to this system, we have one of basic vocational training and education. This may overlap with general education or be more separate from it; a great deal of variation between member countries may be observed in this respect. The system consists of apprenticeship arrangements, Berufsschulen, collèges, lycées techniques, technical colleges and similar arrangements.

Building upon these systems, we have the two continuous education and training areas addressed to different groups of clients; but in each case, these are adults with working experience. On the one hand, continuous education is geared to a vocationally less specific clientele; this builds upon the general education system. Next to it, there is a system of further training, building upon basic vocational training and education; this system is geared to vocationally more specific groups according to different criteria. They may be separate occupations, disadvantaged groups in the labour market (handicapped, unemployed, people in need of re-training) or trainers, to name but a few.

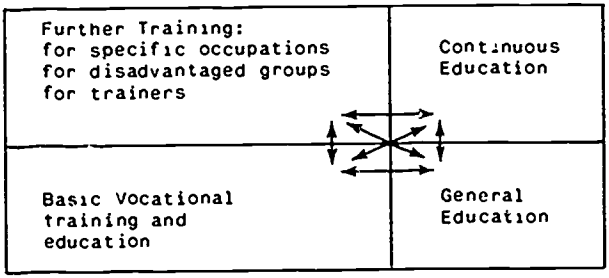
On the basis of this break-down, one may discuss how a training response to new technology may be fitted into more general ideas about the proper construction or re-construction of the overall education and training systems. In the conference, for instance, group I dealt with the need for greater attention to a basic system as an intermediary between school and employment and to provide the foundation for a general technical culture. Group II addressed the question of how to train managers and

employee representatives in the course of further training. Group III focussed on vocationally less specific education in the use of information and computing technology for the public-at-large.

The problem is not only to define training and education measures in each area, but also the boundaries between them and the linkages across such boundaries. This concern was strong, throughout plenary and group sessions. Again, a graphic illustration of the issues may help. In the scheme "Thematic sub-headings for the discussion of new technology and vocational training", education and training areas are ordered in the form of a four-fold table to show boundaries and linkages.

Thematic sub-headings for the discussion of new technology and vocational training

Areas and linkages:



Important aspects:

- institutional questions
- access/transition
- curriculum design
- teaching methods and instruments

The scheme illustrates an important concern of the conference; participants did not only attach importance to the development of individual areas of education and training, but also to the links between areas and the construction of the overall education and training system. Boxes in the diagram should not be looked at as isolated form each other. Any approach has to consider links between boxes. These are indicated by the arrows in the scheme. A measure applying to one box has to be planned in accordance with measures or givens in other boxes. A policy approach has, in order to be effective, to cover the different boxes simultaneously and consider the links between them. In this way, coherence of measures in different education and training fields has to be assured.

This is illustrated by some more concrete examples. A case in point is the idea that a well-developed basic training system which takes in as many people as possible is the best foundation for effective further training to promote professional advance or re-training for economically more stable jobs and sectors. Another case is the suggestion that if data-processing skills are generated through a far-reaching continuous education network, this alleviates the work load on further training and allows it to concentrate on more specific applications of new technology or more urgent retraining needs of problem groups.

Below the scheme, the reader will find a list of aspects which have to be considered in the discussion of measures in specific areas and regarding the overall construction of education and training systems. These are not always distinguished, which tends to contribute to the frequent impression that much as a discussion appears interesting, it does not focus on details as much as appears necessary to arrive at constructive conclusions.

The institutional aspects obviously include the function and capacity of various education and training arrangements, and the modes through which this activity is influenced. This brings in the important aspect of influences from the social partners, which have to be used in such a way as to make the system responsive to existing needs and increase its overall effectiveness by tying it into a network of interdependence with other policies. This has to be borne in mind, particularly when thinking about the overall construction of the training system, but also about increasing the efficiency of detailed measures by increasing its relevance for day-to-day working practice.

Access/transition aspects concern conditions governing the access of persons to training and education arrangements, and their chances of continuing education and training somewhere else, after completing a course, school or apprenticeship. This is particularly relevant ot a discussion of an overall system and the links between its parts, but it is also important for curricula and teaching methods design. Again, it can be seen how overall, global training and education problems have ramifications at the level of detailed and specific measures and arrangements. Although they tend to bring about discussions which might be conducted separately, this is viable only to a very limited extent.

Thus, curricula design and teaching methods and instruments are not only topics for specialist discussion from the point of view of individualised measures. They have, at least, to be linked with the consideration of other aspects within an overall perspective. A specific remark regarding teaching methods is appropriate in view of possibilities offered by new technology. In addition to its impact on contents and existing methods of learning, it is of particular relevance as part of learning instruments to facilitate various kinds

of teaching which need not be concerned with new technology as a content. Participants pointed out that distance learning may be used more extensively since new technology facilitates more adequate distance learning through more interactive, complex and vivid methods.

This point is particularly well worth heeding in view of contributions to an earlier CEDEFOP expert meeting on curricula design, where it was said that microelectronic computers should be used in such a way as to increase the students analytical capabilities. This view integrates findings about general aptitudes required to work with new technology, with the perception of new technology in learning methods. Both are made to match if learning instruments are used to increase analytic skills which are in turn essential to work effectively and independently with new equipment containing diverse micro-electronic applications.

The point of departure of this section was rather technical, in focussing on existing developments in products and their use in work processes. However, this is not to imply technical determinism since the second stept was to analyse thinking about training and education with a view to devising a training policy which was sensible - overall and in detail. This discussion can, however, only be conducted by considering yardsticks for a sensible training policy. Hence, the question is raised as to how to appreciate general training policy and adjust individual measures. Some answers can be given here, by developing arguments in the course of the conference.

2.4 Education and training in the face of socio-economic challenges

The basic question thus is how to shape vocational training policy in the absence of technical determinism. Vocational training was seen to be able to respond to technical change

in many ways; it therefore had some freedom of movement, and it was considered necessary to give indications as to how this freedom of movement should be utilised. Here, it was widely thought that vocational training was confronted with a range of problems which one might call, for want of a better word, a set of socio-economic challenges. These are developed one after the other, in the following.

1) Technical change arises from a complex series of interaction between economic, social, technical and political developments. It occurs continuously, through a succession of changes rather than a revolutionary change concentrated in time. Now, the precise course of this series of interaction is not predictable. Hence the impossibility of conducting vocational training in anticipation of precise future technical requirements. In view of this, vocational training should be given in such a way as to enable individuals to maintain and improve their economic and social position in the course of change. This can only be done if they are able, by virtue of their skills and experience, to take up an active stance in relation to technical change which allows them to take part in the modification, improvement, specification, and active rather than reactive use of new technology. The result of the interaction between different factors is never determined in advance; it originates in social, economic and technical experimentation. The capacity of indivuduals to take an active part in this experimentation is thus one yardstick for effective vocational training.

2) Vocational training should be compatible with a successful employment policy. Although this sounds desirable, controversial views were presented on this subject. One view was that vocational training should be conceived more independently and not be held up by the obligation to contribute to employment creation. This view died not neglect

a concern with unemployment, but it tended to consider it as a legitimatory impediment to the development of vocational training. Another view was that vocational training should be seen to lead to jobs which were essential for economic growth which, in turn, would lead to further employment. A compromise view, such as presented in the general conclusions, is that sound vocational training will not hurt prospects of employment, and it appears safe to say that it gives better assurance against loss of employment.

Another, more specific, point worth mentioning is that vocational training ought to be geared to the needs of groups whose security of employment is more precarious, such as older workers, the handicapped, the unskilled, and those who have not won a firm foothold in the labour market. At least to this extent, concern with the employment problem cannot be avoided. Furthermore, the more it is possible to show how certain kinds of training enhance the employment prospects of those concerned and how a particular supply of manpower is essential for economic growth and employment, the better will the relative position of training policy in public debates, and its perceived importance for the solution of imminent problems, turn out to be.

3) A training policy has, to the extent that it also addresses employment objectives, to be linked with a sectorial policy approach which informs decision-makers in which areas of the economy employment may be maintained or increased. This angle was mentioned as a logical necessity in the conference, but it was not developed much further. It was, however, often stressed that vocational training had to bear in mind that most of the employment creation which

occured at present, happened in small and medium-sized enterprises. This is particularly significant as it constitutes the inversion of an earlier tendency towards more employment in large enterprises. Vocational training policy has to draw conclusions from this inversion and provide training which appears particularly relevant to small and medium-sized companies.

4) Conforming with a view of an active, rather than a reactive training policy, vocational training should take up the technical challenge by deriving implications for equipment and software design. This means that a view of suitable training should inform technical development; the direction of determination should not only be the other way round. This might occur with two objectives in mind:

   a) Equipment has to be developed in such a way that it allows reasonably complete, methodically successful but not too costly learning of new work processes; suitable learning equipment usually lags behind equipment in use.
   b) Individuals who are able to take part actively, in the experimentation with new products and processes, require training on instruments which allow the stimulation of such an aptitude rather than passive reaction in a predetermined way.

5) With the present economic difficulties of stagnating mass markets, output and employment can only be maintained or increased if companies offer goods and services to individual market niches. The customisation of goods and services requires a workforce whose basic level of training is higher than that in the mass production areas of the respective sectors of the economy. Less polarised qualification

structures are therefore needed. This is not to say that this occurs by itself. But it has to be stressed that sound vocational training "from the bottom up" is particularly necessary in times when flexibility of manpower at all levels is essential for economic success.

6) The quality of working life has to be seen in the context of another central issue, organisation of work. This is a linking element in the chain of interrelationships between new technology and vocational training and qualifications. Discussion of new technology has moved to the stage where, in view of the absence of technical determinism, job contents after technical change are seen to be a reflection of, among other factors, the organisation of work. In this way, new technology has been a catalyst in stimulating the development of concepts or the quality of working life, organisation of work and vocational training.

To some extent, different challenges may conflict with each other, but some are also compatible. More effort is needed to explore the precise nature of links between them. An interesting case is, for instance, the linkage between the last two. It may be argued that the danger of polarised qualification structures exists under new technology as much as under old technology. Its prevention is a challenge to various policy-makers; there should be a preference for delivering training and education, and for organising work, in such a way as to make sure that the work force is not polarised into people with more interesting, demanding and better qualified jobs and into those who have to be content with boring jobs largely emptied of the exercise of skill. This consideration is important from two points of view: On the one hand, it satisfies quality of working life requirements, and on the other hand, it also leads to increased flexibility of manpower as required by the evolution of markets. It points

straight towards the concept of a more generalised technical culture as an area for integrating education and practical training, planning and execution, manual dexterity and analytical capability. De-polarisation and development of a general technical culture are thus two sides of the same coin.

2.5 The role of social actors

Throughout the vocational training system, the involvement of the social partners is crucial. There are several reasons.

a) Their involvement is needed in order to conduct training in close touch with the evolution of working life. This should increase the effectiveness of training and the chances of trainees finding jobs.

b) Involvement is necessary to make sure that not only training, but also the development of new technology and the mode of its introduction and use is socially acceptable. Less acceptability not only reduces motivation and health levels of employees, but may also raise barriers to innovation, as well as putting up operating and investment costs. Involvement is therefore a productive resource, too.

c) Involvement reduces political or industrial relations conflict over new technology. Adaptation and general reform of vocational training may, in fact, be less hampered because of practicable ideas and pilot project or other experience. A more important impediment may be political controversy over and above factual training issues. Such controversy has to be dealt with as early as possible in an institutional way.

The question of participation in the introduction of new technology is too often miscast as one of "acceptance" of equipment assumed as given, by a workforce or its representatives.

Effective participation, however, requires that it should be extended over the design of equipment, the planning of its introduction and the work organisation surrounding it. Participation can therefore not be limited to more formalised institutions of vocational training, nor can it be restricted to collective bargaining. It has to start at the grass roots, by way of the early involvement of qualified personnel. Assurance of timely and sufficient adaptive retraining, as well as of a generally adequate supply of qualified labour "from the bottom up", must be part of this procedure. It fits in with the concept of an emphasis on basic vocational training to generate the labour flexibility and responsiveness to market opportunities needed to create employment.

3. ORIENTATIONS FOR VOCATIONAL TRAINING

The conference had a particular value in giving a qualitatively representative picture of reactions to the theme in the member countries. Perceptions of the underlying problems have been analysed, ordered and systematically developed in the preceding part of the present paper. This is the basis for developing orientations for vocational training, the topic of this section. It is not intended to recommend policy conclusions which can immediately be translated into Community or governmental measures. Rather, the purpose is to provide a conceptual framework to guide the search for policies in the appropriate bodies.

The presentation in the following continues the points of argument from the preceding section, and it develops these into orientations. This procedure implies, however, a re-ordering of the sequence of points of argument. It is convenient to start with the consideration of socio-economic challenges.

3.1 Implications from socio-economic challenges

1)

Vocational training policy cannot be isolated from the concern with unemployment. It has to be conceived in such a way that it can be seen to be linked with employment creation. This does not mean that it must be the primary direct cause of better prospects of employment. However, it should appear, as part of a wider strategy, to contribute to achieving this purpose. Such an approach leads on to more specific orientations:

a) Vocational training should be conducted in such a way that it helps rectify larger qualificational disequilibria in the supply of and demand for labour. It cannot anticipate precisely how demand for labour of different qualificational and occupational categories will evolve in future. But it should equip people with a set of skills which enables them to follow shifts in patterns of demand for labour.

b) There is a special responsibility to cater for those who are particularly disadvantaged in the labour market, such as older workers, the handicapped, the unskilled, women, young people or others who have not gained a foothold in the labour market. It is immaterial whether new technology has contributed to their predicament or not; but it should be examined how new technology can be introduced, utilised, and used for further training purposes.

c) A more exacting approach would, in addition, try to locate such kinds of occupations and training as would be essential for the promotion of economic growth. This involves seeking out qualificational and training bottlenecks, and thinking about ways of removing them. It also involves the development of ideas on which kinds of larger skill brackets or occupational areas are more important for employment

creation through entrepreneurship and expansion, particularly in those sectors where growth is thought to feasible.

This orientation has two angles. At the sectoral level, it involves the search for potential of economic expansion and the corresponding removal of qualificational bottlenecks and barriers to desired labour mobility. On a more general level, one may develop occupationally unspecific entrepreneurial qualities in people and in organisations, for instance by implementing the "innovative learning" approach shown in the paper for group II. This is an intriguing example of very specific action to generate economic dynamics and employment. It is distinctive for improving occupational competence without focussing on occupational specialties, or individuals as primary objects of training. Rather, it stresses the value of collective learning within given organisational units, without dealing with each occupation separately. Such an approach, much as it is to be recommended, falls outside the notion of vocational training in many countries.

2)

A training policy has, to the extent that it aims at job creation, to be linked with ideas on sectoral developments or sectoral economic policy. These are likely to differ from one country to another and from one school of thought to another. However, it seems fair to say that small and medium-sized enterprises are currently and in the foreseeable future more important as a source of employment. Thus, training should be given in such a way that it helps inter-firm labour mobility and does not lock people into the internal labour markets of large enterprises. It should also be geared to preparing people for entrepreneurship rather than employed work only.

3)
Vocational training cannot anticipate precisely which skills are going to be required at which date to which quantitative extent in the future. There is a continuous stream of technical development to be considered, rather than one single technical revolution with well-known precise implications for training. Furthermore, this stream has turned into a river delta with many branches, as microelectronics has become diffused to ever more parts of the economy. This gives rise to the necessity of considering training implications in a great number of occupations separately, rather than dealing with implications of "the" technology.

The list of general qualities needed to work with new technology is not very long, and it is well-known. Such qualities can be transmitted at school and in the way vocational training is conducted, particularly if new equipment is used to enhance the analytical, independent problem-solving, and logical thinking aptitudes of students. More difficult, however, is the identification of precise vocational training in individual occupations. This entails a consideration not only of implications of "new" technology, but of the "old" and the "new", of microelectronics, data processing and other most diverse occupational specialties. The most noteworthy effect of microelectronics may indeed be to further the development of established occupational specialties in their own territory.

4)
Continuous advance of technical development into a clouded future implies the importance of constant experimentation and its evaluation. A great number of experiments have already been made in the member countries, in the most diverse fields. Such experiments are often unplanned. Further experimentation would benefit from the gathering and interpretation of previous experience.

5)

The present and foreseeable economic situation is less distinguished by the prospect of expanding mass markets. European countries, in particular, have competitive advantages in the more customised manufacture of goods and provision of services. Vocational training should be geared to increasing the competitive advantages arising in such areas of manufacturing and services. This implies a greater valorisation of basic vocational training for as many people as possible. A reduced polarisation in the distribution of skills and qualifications, which is within the logic of such a strategy, is essential for economic expansion into more differentiated market niches. This, then, is the underlying rationale for an approach both regarding the mode of utilisation of new technology as well as the development of the training system.

3.2 Changing education and training systems

Based on this analysis of socio-economic challenges, one arrives at the development of concepts regarding the construction and reconstruction of the overall education and training system. Training cannot be considered in isolation from education, and it is equally important to stress the links between general and continuous education, and between basic and further training. Again, it may be useful to consider different points regarding this subject.

1)

General education may usefully pursue a policy of generating general skills and knowledge widely perceived to be important in many applications of new technology, by using general purpose computers with a view to stimulating independent analytical problem-solving capabilities and basic familiarity with mini-computers and related equipment. The intention should therefore be to aim higher than limited operating capability.

The purpose should be to stimulate basic skills which may be used in a wide range of occupations and leisure activities, as well. These competences were described as computer literacy, in the sense of being able to use computers intelligently, and general problem-solving skills which rely on systematic analytical thinking and ease of translation from abstract to concrete modes and vice versa. If such skills are produced in general education, vocational education and training may concentrate on occupational specialties and their specific problems, rather than providing "remedial" education. This does not mean that general education should be looked on as an isolated entity which precedes the phase of technical education and of training. Development of human capacities requires a consideration of the great diversity of individuals and the weight of socio-cultural handicaps. At the end of compulsory schooling, there is a great proportion of school leavers in every age group who are still not able to master the intellectual tools necessary to profit from specialised vocational training. Consequently, the transition from school to vocational training needs greater attention than in the past.

2)

Basic vocational training and education is particularly affected by the response to new technology. This is not to imply that basic training ought to deluge trainees with new technology. However, the present tendency of the evolution of qualifications in the labour force is such that the untrained, or people considered as unskilled, are confronted with much more severe risks of unemployment. This tendency fits in with the practice, in manufacturing and services, of reducing employment through automation of task performance, and placing increased emphasis on working skills, particularly flexibility in a greater variety of tasks, "from the bottom up". Moreover, there is a need for an "intermediary" between school and specific jobs. A well-established vocational training system can fulfil this

function; it should offer clear-cut profiles of employment opportunities to school leavers and provide them with a source of skills and an occupational identity which helps them cope with future labour demand patterns that are hard to predict. Such a system of vocational training thus appears as the cornerstone of a technical culture, fostering long-lasting flexible skills as well as greater labour market transparence and social-occupational identity.

From experience, one may also predict that such a system is a primary requirement for increasing the attractiveness and effectiveness of retraining measures. It can therefore help to avoid problems arising when workers have been alienated from the education and training system to such an extent that it becomes increasingly difficult to retrain them for new or more stable job opportunities.

Whilst an introduction to new technology appears to be lagging behind, in basic training, its role should not be overstressed, either. This is to be understood in the sense of the idea that both "old" and "new technology" have to be considered, as a slowly and continuously changing amalgamation of "old" and "new" techniques. The cases where the "new" makes the "old" redundant are comparatively rare. Particular attention should be given to the interaction between both. As a result, "conventional" technical or occupational specialties undergo a noteable change and generate changes in training, and such changes are not necessarily most distinguished by the incorporation of information-handling equipment. Cases in point are

- qualified bank or insurance clerks whose job profiles change because company organisation changes, this being rendered possible by new technology, whereas the direct effect of new equipment on job content is less important;

- computer numerically controlled machine-tool operators who have to master geometrically more complex and much faster cutting processes performed with new tools, and where job content is more dependent on company strategy and organisation than on CNC technology as such.

3)

Further training has to cope with diverse requirements. On the one hand, it is expected that it should ease the employment or re-employment problems of large groups in the labour force, beyond what are called "disadvantaged" groups, who are all threatened by social marginalisation if care is not taken. Structural change in the kind of workplaces on offer and the content of their work is easier to adapt to for those who have had the benefit of good education and training, whereas others with deficient initial education and training are socially threatened. This is not remedied by re-training or programmes which up-date vocational skills and knowledge, because in such cases, the target persons would not be able to follow the course and profit from it. A much more fundamental approach is called for, in order to lay a vocational foundation in further training by generating basic skills and learning capabilities.

In addition, further training has to meet very specific training requirements to adapt existing skills and knowledge. Last but not least, continuous training of the trainers and of teachers is crucial to minimise the gulf between education and training on the one hand and working life on the other. Such a range of tasks brings about the need for very specific methods and courses closely tailored to the needs of respective groups. There was some controversy about the value of shorter courses as against thorough vocational training. In fact, the tow should not compete but complement each other. As already mentioned, good basic training is the major condition for sufficient take-up and success of further training.

Again, it must be mentioned that the value of purely micro-electronics or data processing related courses is limited. This ought to be taught with a specific bearing on existing occupational specialties, or at least against the background of a given set of tasks and skills. Distance learning, which may be particularly important in further training, can be enhanced by using pedagogically more interactive, substantively richer and more flexible equipment which is one case of applied microelectronics.

Just as in the cases of basic education and training, further training and continuous education should be looked at simultaneously. The boundary is blurred, institutionally different from one country to another, and often not helpful.

4)

Continuous education is the primary means of developing computer literacy in the population on a larger scale, particularly through the use of the media. The BBC case, demonstrated and discussed in group III, is well worth heeding. General education can only address present and fuutre age groups in schools. Computer literacy for older groups which are part of the labour force, however, is effectively generated through continuous education. This appears well-suited for generally applicable information and communication technology contents.

In this way, it complements vocational training, both basic and further, if it enriches the more generally available range of general cultural skills. It can therefore reduce the burden on vocational training, by relieving it of "remedial" education, i.e. of making up for shortcomings in general education. General cultural skills, in this case, include computer literacy up to the level of computer use to promote general analytical problem-solving.

The overall construction of the education and training systems can be seen to follow, above all, the perception of socio-economic challenges and more general ideas about the pre-requisites of a workable system in view of these challenges. It cannot be, in the first place, a direct response to what might be the absolute requirements of new technology. This is repeated here to make it quite clear that the neglect of direct implications of new technology for vocational training is deliberate. These have only come in, so far, in the form of a concept of generally useful skills and knowledge, rather than vocationally specific skills. Naturally, these have also to be dealt with, in the course of this section. But their general treatment cannot advance much further beyond previous generalisations.

There is a novel problem with regard to qualifications. Before, quantitative questions about qualifications needed had been in the forefront of debates. Nowadays, the distribution of employment over categories of the population and qualitative issues are central, which raises new uncertainty. This applies, particularly, to the question about new competences in generating and absorbing technical change on the basis of "informal" aptitudes. Such qualifications are not only individual, but also collective properties. They have to be built up within a strategy against the "polarisation" of skills and qualifications. They are not necessarly certified or formally examined. Their acquisition happens more through day-to-day work than in the education and training system. They are crucially shaped by the organisation of work, and they permit the individual to maintain and develop capabilities for which formal education and training lay a foundation. Concepts of collective day-to-day learning are neglected both in the education and training systems as well as in the management and organisation of workforces. On the other hand, they are particularly needed in order to maintain the adaptability of the individual to new jobs and new contents of work.

The absence of new concepts and methods is particularly striking concerning the training and employment of young people. This specific problem has to be treated in conjunction with adult training. The reason is that one has to differentiate between two broad groups of employing units and jobs: Some companies hardly recruit young employees, but only candidates with substantial experience. Other companies or shops, on the other hand, are primary training grounds for young people. This mobility has to be borne in mind in designing a more effective manpower and training policy.

3.3 Thematic foci

A last remarkof the rapporteur général concerned levels of analysis in work about the introduction of new technology. The debate was generally characterised by the multitude of factors which played a role, and the absence of one dominant influence. This made it very difficult to generalise about relationships at a more abstract level. Thus, a common reply to generalised suggestions at the conference was that "this is not concrete enough". The retort was only natural, in the face of difficulties of generalisation. Concrete illumination was possible in single cases, but there were great impediments to a generalised treatment which remained concrete and vivid enough from the point of view of individual cases of applying new technology.

The analysis of this problem appears correct, but the problem is not just one of the dialogue between "researchers" and those who like to call themselves "practitioners". "Practitioners" have the same difficulties of arriving at a generally applicable yet concrete and vivid account. This has to be said, in addition to Monsieur Valli's observations, to corect an interpretation which seemed to be prevalent at the conference. There was, to some extent, a kind of language barrier between researchers and others, although this is already

a crude simplification. There were equally some barriers of understanding between larger cultural and linguistic areas, between participants who were more accustomed to a view of training within general socio-economic and political perspectives, on the one hand, and the "technicians" of training, education or management on the other. Whatever such differences were due to, the conference made it apparent that it is necessary to improve generally applicable conceptions of the topic discussed. There is a need to work towards a closer integration, not only of different national points of view and experience, but also of concrete experience with new technology and vocational training across diverse product or work process specific applications.

Monsieur Valli suggested that general mechanisms or relationships between factors were already sufficiently known. This was not a bottle-neck. There was, on the other hand, a lack of knowledge about which general mechanisms applied in individual cases. He suggested a step-by-step research approach to clarify such issues, starting out from an analysis of training and manpower policies in specific sectors, passing through occupational demography and analysis of manpower recruitment, and finally arriving at the consideration of relations between new technology and job contents, work organisation and training in view of stated manpower policies.

The combination of "old" and "new" technology, where definitions of "old" and "new" are continuously changing, and the continuing importance of occupational specialties, work together to yield a highly complex picture of training opportunities and changes. This cannot possibly be developed here, nor in a general conference. Almost paradoxically again, very precise answers to the question, which skills and knowledge are distinctive for applications of microelectronics, are all the more impossible as the importance of microelectronics increases! This happens

because in the course of the diffusion of microelectronics, the range of occupations affected by it becomes increasingly heterogeneous, and occupational characteristics are not assimilated.

There is thus ample opportunity for specialised discussion, investigation and comparison of how the evolution of skills, occupational identities and training requirements are seen in different countries. Of necessity, any discussion of more precise statements on such matters therefore has to be conducted in more specialised circles. This does not mean that the debate should become technocratic, removed from socio-economic challenges and ideas about the general functioning of the education and training systems. But it seems fair to say that there is a need for "semi-autonomous" discussions,

- one of them concerned with the overall construction of the education and training systems,
- whilst the other kind of discussion is specialised with regard to occupations.

There should be feed-back between the two kinds of discussion because each has to keep track of the other one and has a great deal to contribute to it. Progress is only possible, however, on the basis of a partial division of labour integrated by a common concern. This bifurcation of the discussion would have implications for the thematic focus: A treatment of the overall construction of education and training systems would, in addition, focus on socio-economic challenges, but would not devote much time to considering precise proposals for training in specific occupations or courses. It would furthermore be distinctive for a pronounced non-determinist view, i.e. technology would not figure as an independent cause, but it would be discussed as an object to be shaped together and at the same time as vocational training.

Specialised discussions, on the other hand, would tend to deal with training in response to technology, against the background of tacit assumptions regarding topics in the other discussion. To that extent, it would be a discourse of training pragmatists who remind themselves of the background issues by staying in touch with, and taking part in, the other discussion. Tu sum up, one may characterise the two kinds of debates in the following tabular form; note that the two debates are linked by feed-back loops.

	Debate:	
Characteristics	Overall construction	Specialist-pragmatic
Target	Overall construction of education and training system	Skills and training changes in separate occupations
Primary explicit reference	Socio-economic challenges	Technical change, its absorption and fashioning in working life
Mode of concern with skills and knowledge changes	Focus on general aptitudes as largest common denominator	Focus on composition of specific sets of skills and knowledge
Primary policy concern	Interaction between manpower, education, training, sectoral, industrial relations, etc. policies	Basic and further vocational training
Organisation of discussion	Integrated session of representatives of different policy fields and interests	Differentiated sessions according to occupational groups

A rather specific, but important point worth mentioning for the agenda of specialised discussions, in particular, is the opportunity to discuss equipment design from the point of view

- suitability for training purposes, and
- suitability for practical utilisation in working life, according to general ergonomic, organisational and skills development criteria.

In doing this, one may promote diffusion of new technology within a qualitative strategy of labour use, facilitating user adequacy of new equipment, ease of training, and adequacy in terms of socio-economic challenges at the same time.

3.4 Diversity of problems and approaches

The national differences which emerged at various points in the proceedings should not be interpreted as a stumbling-block on the road to harmonisation. Not only perceptions and institutions differ between nations, but also the objective conditions of problems at hand, their subjective definition, and the appropriate means of resolving them. European activities can therefore not have the aim of developing universally accepted views and recipes. They do, however, help to increase the richness of impresssions, ideas and interpretations which decision-makers need in order to exercise responsible choice in a field which is devoid of determinism.

The situation in member countries of the EC is not quite the same regarding preferred sectoral policies, education and training arrangements and current needs, and a great many other aspects. A European perspective of desirable vocational training is therefore limited by different situations and preferences in the member countries. This does not affect the importance of vocational training as such at the present time. But it does affect answers to the question of which action should be taken, in more concrete terms.

Papers for working groups nicely illustrated different policy emphases. The paper for group I demonstrated a "French" concern with vocationally less specific education and expressed the need for an intermediary stage between vocational education and work in a job, which might stabilise a "technical culture". In group III, the paper expressed a "British" reliance on good, innovative public media used to enhance practical, but vocationally less specific training for information technology. The paper for group IV documented the "German" reaction in the form of re-asserted emphasis on craft and clerical training by apprenticeship to cope with dynamic training requirements. Group II was initiated by a less "national" paper which stressed the universal necessity for management and skills development to promote organisational learning and security of employment through innovation. Accordingly, this paper was less focussed on national institutions.

The final plenary meeting yielded the idea that a more integrated European technical culture should be built around new technology. On the one hand, this is plausible in view of the existing activities of multinational companies, which would also facilitate an integration of sectoral and training policies. On the other hand, there are limits arising from different personnel, recruitment and training practices even in multinationals, and from the diversity of less concentrated sectors where applications of new technology are increasingly being diffused and developed.

The limits and possibilities of developing a common technical culture and of harmonising training and qualifications may now be analysed in line with the pyramid presented in section 2.1. This may imply that, as one starts at the top of the pyramid, in the electronic components part, possibilities of harmonsation and labour mobility across frontiers are greater, because of the greater activity of multinationals and the greater importance of transnational trade.

However, as one passes through intermediate parts of the pyramid down to its basic layer, legal, market-specific and institutional diversity increases. This runs counter to harmonisation tendencies. Particularly, this may be so in the user-specific software areas where development has to be closely adjusted to legal and institutional requirements in countries. Generally, it can already be noticed that countries respond to similar technical challenges posited by similar equipment by incorporating new technologies into employing units in such a way that existing practices of work organisation and training have to be changed as little as possible. However, there was controversy, particularly in the final plenary meeting, about whether this was likely to remain so. The issue was the extent of turbulence which was likely to ensue under the impact of new technology. Three basically different points of view could be distinguished:

I A revolutionary view: "Things won't be the same again after this." New technology was going to upset and dramatically affect education and training arrangements.

II A reformist view: "New technology does not lead to substantial education and training changes, but it is a good occasion for fuelling the debate about issues which are already well-known." Among the latter, there are lifelong learning, broad-based skills, the relationship between education and training, the relative importance of general vs. specialist competence and experience, and polarisation tendencies.

III A conservative view: "New technology does not require the modification of education and training systems." Piecemeal alterations are appropriate here and there, but these do not break the continuity of steady change which has been taking place in any case.

This controversy was neither resolved nor dealt with explicitly over substantial parts of the conference. It is likely to persist, as an undercurrent of public debates. The issue cannot be settled here. At least in part, different points of view are also linked with national differences. Furthermore, the field of discussion has become so vast that one single perspective is possibly not enough for surveying it. For instance, the generation of appropriate general competences in the education and training system (analytical thinking, orderly processing of symbolic codes, ease of translation from concrete and rich thinking to abstract thinking and vice versa), may appear as a daunting reformist task which does, however, not break historical continuity. On the other hand, a large number of occupations in applications of new technology at the bottom of the pyramid may only require piecemeal modification, following the conservative view. It might be argued, in the third example, that sufficient job creation and occupational insertion of young people, in view of demographic patterns and reduced employment because of productivity increases larger than capacity expansion, is only possible if much more radical changes take place.

It can be seen that the existence of conflicting perspectives is at least partly legitimate because of the multiplicity of issues involved. This impression certainly came across very strongly in the conference. Controversy can therefore only be reduced if the vast field of discussion is structured more carefully, and if perspectives are more explicitly focussed on their appropriate domain. At least to some extent, problems may be viewed differently because national perspectives are legitimately different.

It has to be expected that existing national institutional differences will be maintained as new methods, curricula, course and overall structures are developed. Countries are likely to proceed on parallel paths of development, which is

something different from convergence. This is particularly so as microelectronics is increasingly diffused, and in this way tied in with existing particularities of the occupational structure, training and education systems, and nationally specific sectoral policies and strategies of enterprises.

This limits the space for developing a common technical culture. A European technical culture may be be developed more intensively along different paths. Possibilities of convergence may,however, be sought at the higher reaches of the pyramid proposed at the beginning of the preceding section of the paper. There is thus an opportunity to strive for a common sectoral strategy, educational and training assimilation, and greater labour mobility, particularly where electronic components and generally applicable computer and communication equipment are concerned. But in the last resort, this is more a question of industrial power politics than anything else which not only involves the interests of large multinational companies, but also those of member governments some of whom are already strongly active on the basis of national interests.

At the second stage of reflection, some ideas can be advanced about how the suggested orientations may be taken up, particularly at the level of the Community. First, it has to be stressed that the possible role of new technology as a vehicle for harmonisation of vocational training can only be very limited. It may only arise with regard to the top of the pyramid. But there is an opportunity and necessity to compare such practices in the member countries as respond to similar socio-economic challenges. The goal of such an activity cannot be to arrive at the one best solution of vocational training and education. Countries and the whole Community may, however, profit from systematically comparative analyses about what they do in the various policy fields, and from general conclusions derived from joint experience.

3.5 Proposals about future work

CEDEFOP and the Commission appear well-suited to take over the role of doing systematic comparisons and drawing conclusions which may be used as an input into EC or national policy-making. The overwhelming impression from the conference is that there is a great amount of experience with a great diversity of training and education schemes, and that there are many policy plans in the member countries, all of which ought to be jointly considered for the joint benefit of those involved in training and education.

In view of the orientations developed here, and in view of work already under way, one may suggest the following pragmatic approach to take on this task. Pragmatism is not a matter of conviction, in this case, but a response to the complications in dealing with the nexus between new technology and vocational training. The discussion of new technology serves to stimulate a debate which is not, and cannot be, only about the consequences of new technology. Rather, it is concerned with how vocational training should respond to socio-economic challenges, and how vocational training and the application of new technology should be developed simultaneously in such a way that challenges are met. Sometimes, the focus on new technology in the course of this debate may even be peripheral.

The implication is that there can be no "departmental" structure whereby one group deals with new technology, and other sections with something else. This is demonstrated by the necessity to work on the overall construction of education and training systems, along the lines suggested here. This concern would have to be dealt with through a great deal of collaboration between specialists in various areas of education and training. Within this collaboration, some specialisation

is needed, for instance about the important issue of basic vocational training and its links with other areas. In the course of this kind of work, implications for the introduction of new technology can be derived.

A second focus of work which comes to mind, is training and other measures for the large part of the labour force which is not sufficiently armed to enter into retraining schemes which are necessary, by reason of insufficient basic education and training. In particular, this kind of work would deal with ways of providing training for, and remedying the handicaps of, such groups as young unemployed, older workers, handicapped people, and women. Evidently again, some specialisation is appropriate. New technology is not involved as a primary and direct source of problems. To the extent that new technology is a source of problems for specific groups, this is well known already and does not need further elaboration. The overriding source of concern is not technology directly, but reduced growth, comparatively less reduced productivity increases, and changing qualification structures in employment in response to socio-economic challenges. Thus, new technology comes into the range of discussion under this focus, as

- a possible bundle of contents for (re)-training curricula, and
- a means to improve distance learning.

This focus is different, from the last one, in concentrating on specific groups according to criteria which are not necessarily vocational or occupational. The last focus was to do with the performance of general vocational training and education functions. The third one now takes up the specialist-pragmatic debate mentioned earlier; it deals with detailed changes happening in vocational training for individual occupations.

Needless to say, this implies a higher amount of specialisation to take account of such a variety of specific developments. However, this does not preclude the possibility of generalisation.

The two focusses which are more important for determining a training concept with regard to applications of micro-electronics, are the first and the third, the overall construction and the specialist-pragmatic focus. The second one is equally important from an employment policy point of view, but its bearing on utilisation of new technology is more of a sideline. It is linked with the overall construction focus, for the determination of job openings and re-training opportunities, and it is linked with the specialist-pragmatic focus, regarding the development of curricula and teaching methods. Even stronger interaction is, however, needed between the first and the third focus, which was already reflected in the scheme on page 43. This is necessary so that they do not drift apart, to isolated overall speculation on the one hand, and the socially blinkered idiocy of the specialist on the other.

Currently, there appears to be more of a backlog regarding specialist-pragmatic comparisons and analyses, whereas the overall construction focus has already got off to a good start before and during the conference. It may therefore be advisable to start a series of specialised projects for individual occupations. After these will have yielded results, the two complementary focusses may again be brought together in a larger meeting and publication.

4. GENERAL CONCLUSIONS

The discussion of technical change, employment, qualifications and training is extremely wide-ranging. This has often led to confusion, through the fact that contributions over a wide range of issues have been mixed in such a way that the discussion became unfocussed. Thus, the typical phenomenon of meetings on the subject has been that despite the impression that a worthwhile topic was being dealt with, participants walked away with the feeling that nothing new had been brought to their attention, or that the dialogue was not coherent. The dilemma results from a constellation of influences which has to be borne in mind when the topic is discussed. The constellation of influences encompasses so many factors that a discussion is in danger of being about everything and nothing at the same time.

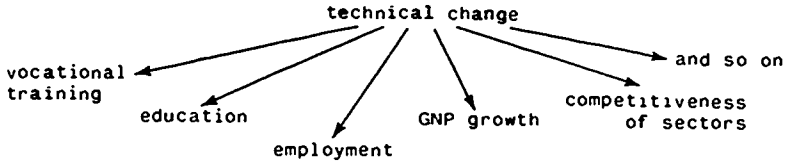
Now, it is undeniable that new technology has something to do with so many factors -loosely speaking - that a narrowing of the focus of the debate is subject to the danger of an overspecialised dialogue about those parts of the issue which are most easily resolved and, at worst, trivial. This, then, is theScylla and Charybdis of any discussion of the subject: The Scylla is the juxtaposition of rather ill-connected arguments along a very wide thematic range; on the other hand, we have the Charybdis of a trivial, overspecialised discourse which is out of touch with the burning issues of the times. Any meeting must be on its guard to steer a careful course between Scylla and Charybdis in these forms; some conferences have already run aground or sunk here.

The CEDEFOP/CE conference did not clear them without any damage, at all. But in the end, the way the conference ship sailed through, provides some important conclusions about how to

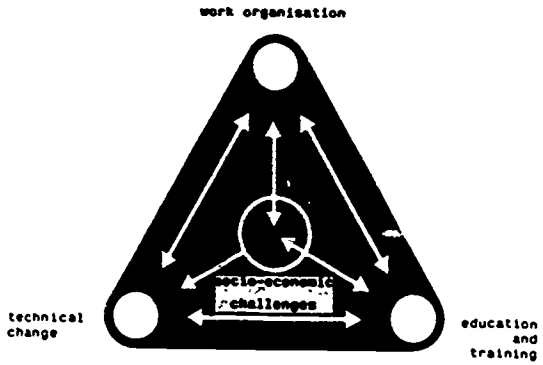
navigate this dangerous spot in future. These conclusions may be used for further work on the subject at the Community level, whether in conferences, expert meetings, deliberations on directives or any other projects. Such conclusions start from a number of basic insights and assumptions.

First, the conclusions drawn by Monsieru Valli at the end of the conference, as reflected in section 1.2, apply. This means that a short-sighted consideration of immediate, stable determinisms whereby new technology influences vocational training or other factors, is neither viable nor wanted. In consequence, consideration of the topic has to be broadened out. This means that some distance is taken against Charybdis. In doing this, the ship sails closer to Scylla, with wide-ranging discussions which might leave some participants confused about how technology comes into the picture. Accordingly, it was shown, in the second section of the paper, how a notion such as "microelectronics" needs to be differentiated, for a start, in order for a coherent discussion to take place. This makes a treatment of vocational training implications more viable. These, however, have to be seen in the perspective of the evolution of education and training systems. This does not just follow from, but influences in turn, vocational training in response to technical change. This left us, toward the end of the second section, with the question, what are the factors which education and training have to be referred to. These were then posited under the term "socio-economic challenges".

The course chosen to steer clear of Scylla and Charybdis can therefore be expressed as the choice of a particular model of the analysis. Too often in the past, commentators have thought, sometimes explicitly and more often implicitly, in terms of the following model of influences:



This is the model which was rejected from the outset, in planning the conference, and alternatives for it were proposed in a number of contributions, at least implicitly. On the basis of a view of the conference in retrospect, the alternative model proposed here to integrate contributions in papers and oral statements, is the following:



This model allows a definition of the wider set of problems confronted, and it yields a heuristic pattern for dealing with influences between complex factors. The model was shown in greater detail in the second chapter of the paper. It was then

used, in the third chapter, to provide orientations for vocational training. Thus, technical determinism was replaced by a simultaneous and parallel questioning of

- training and education development, and
- technical development,

in response to socio-economic challenges, including the interaction between training/education and technical development.

This pattern was used to break down the discussion, into parts which appear functionally complementary: Vocational training can be discussed, as part of the overall education and training system, in response to socio-economic challenges which also mark technical change. This is the "overall construction" of education and training systems, as one important part of the general discussion. Such a discussion is complementary to that with regard to the interaction between technical change and education/training; both debates cannot be isolated one from the other. A more separate discussion would be that with regard to training or other measures to help problem groups in the labour market cope with technical change under the prevailing socio-economic conditions. The relative separation of this discussion is occasioned by the fact that it integrates a concern with most of the factors mentioned. It is thus more self-sufficient, and also separated by a focus on specific groups in the labour market.

Starting out from such a framework, it is possible to enter into a closer consideration of specific issues without getting lost in a fragmented discussion. The framework may now be used to maintain coherence between the manifold activities with regard to technical change, employment, qualifications and training, at the same time as generating further ideas about possible projects or measures. The underlying model can be

used to promote a division of labour as well as feed-back and cross-fertilisation between different areas of work. This, then, might be a viable course between Scylla and Charybdis.

This requires a self-discipline which has in the past often been lacking when commentators in all manner of conferences or symposia touched on the issues mentioned in the title of the conference discussed here. What is needed, in the future, is the awareness that the rich diversity of issues linked with technical change cannot be a reason for everybody to speak his mind about any question of detail or grand issue, at any givenmoment and in any given place. Instead, a disciplining scheme of referecne has to be accepted for ordering contributions according to substantive content, arranging a sequence of argument, and thereby making a meaningful discussion possible. Such a scheme of reference can only be imposed if it is not felt to be alien by those who are to observe it. It therefore needs substantive corroboration and legitimation. The scheme developed here, on the basis of conference proceedings, may yield a legitimate framework for structuring further work and contributions.

It may then be used for the comparison and evaluation of institutions and policies, as a basis for action at the European level. At this level, the primary challenge in the range of issues confronted by the conference is to provide a European focus of comparison and conceptual integration in an area where national activities have been plentiful already and offer a rich testing ground for alternative policy concepts. This challenge implies a fairly clear-cut task for the future; the task cannot be to duplicate pilot projects which have already been conducted in the member countries. A minimum requirement for independent pilot projects organised at the EC level would be that they are demonstrably ahead of those projects and resulting experience which have already accrued in the member countries and await comparison and synthesis.

On the other hand, it can be seen that the conclusions of the conference, as they are drawn in the present paper, broadly support the line that the Commission has been taking on vocational training policy for the 80s (Com (82) 637). This follows from the "overall construction of education and training systems" focus. Such a concern is particularly welcome since it directs attention to the purpose of vocational training as an investment into productive assets, rather than a short-sighted view of it as a cost factor which detracts from revenue. This approach ought to be developed further; it illuminates a proper course for introducing new technology as well as it responds to current socio-economic challenges.

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