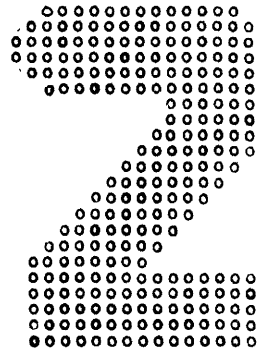

SOCIAL CHANGE AND TECHNOLOGY IN EUROPE

INFORMATION BULLETIN No 2

NEW INFORMATION TECHNOLOGY AND UNEMPLOYMENT

Notes on a debate

December 1981

COMMISSION
OF THE
EUROPEAN COMMUNITIES

Directorate-General
Employment, Social Affairs
and Education

V/A/2

EUROPEAN POOL OF STUDIES

V/1087/81 - EN
Orig. : FR

SOCIAL CHANGE AND TECHNOLOGY IN EUROPE

Information Bulletin No 2

- December 1981 -

2nd edition March 1982.

Provisional address: Rue de la Loi 200, B-1049 Brussels — Telephone 2351111 — Telegraphic address: "COMEUR Brussels"
Telex: "COMEU B 21877"

Cette étude a été réalisée par la Commission des Communautés Européennes dans le cadre de ses "Programmes de Recherches". Les analyses et les propositions présentées n'engagent pas la Commission. Pour tout renseignement concernant cette étude, prière de s'adresser à : Melle Sheila HANNA - DG V/A/2 - Bâtiment Archimède 1 - 5ème étage, bureau 5/29 - tél. 235.52.47

This study was carried out by the Commission of the European Community as part of its "Programmes of Research". The analysis and the results presented do not commit the Commission. Information concerning this study can be obtained at : DG V/A/2 - Miss Sheila HANNA, Building Archimède - 5th floor, room 29 - tél. 235.52.47

QU'EST-CE QUE L'E.P.O.S. ?

Sur proposition de la Commission, le Comité permanent de l'Emploi a donné un avis favorable à la création d'un Pool Européen d'Etudes et d'Analyses (E.P.O.S.) dans le domaine de la nouvelle technologie d'information et de l'emploi.

Ce Pool a trois fonctions principales :

- rassembler et évaluer les recherches effectuées et les expériences significatives au niveau national ;
- diffuser et comparer ces activités de recherche et ces expériences, en mettant des synthèses à la disposition de ceux qui participent aux débats politiques et scientifiques, tout particulièrement les partenaires sociaux ;
- orienter, pour le futur, les études et analyses factuelles et prospectives.

Actuellement, le travail du Pool consiste essentiellement en la réalisation d'une base documentaire, de bibliographies commentées et du présent bulletin.

WHAT IS THE E.P.O.S. ?

The Standing Committee on Employmentwas in favour of the Commission's proposal to set up an European Pool of Studies and Analyses (E.P.O.S.) in the field of new information technology and employment.

The Pool has three main funotions :

- to collect and evaluate completed research and significant developments at national level,
- to compare and circulate the results of such research and developments, by making summaries available to those who take part in political and scientific debates, in particular employers and trade unions,
- to play a more directional role, in future, vis a vis factual studies and analyses.

At the moment, the Pool is essentially working on the preparation of a data bank, on annotated bibliographies, surveys and on the current bulletin.

V/1087/81 - EN
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NEW INFORMATION TECHNOLOGY AND UNEMPLOYMENT.

Notes on a debate

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November 1981

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Preface

SOCIAL CHANGE AND TECHNOLOGY IN EUROPE will now be published monthly, contrary to the announcement in Bulletin No. 1

In addition to the regular national reports, it seemed a good idea to open the Bulletin to contributions from the Commission - or written on its behalf - of interest to politicians, the two sides of industry and research scientists in Europe.

This arrangement will be inaugurated in this second issue on the theme "computerization - jobs - unemployment". It consists of a critical analysis of the debate, together with summaries of some thirty studies on the subject.

The next issue will contain a list of publications by subjects. Bulletin No. 4, to be published as scheduled, will contain the second set on contributions from national representatives.

EPOS

INTRODUCTION

Since the mid-70s, there has been a revival in Europe of the debate on the relationship between technology and employment. The issue is not a new one. Since the advent of capitalism it has cropped up whenever there have been serious economic difficulties. Looking on the dark side, it is at such times that recession and unemployment rear their heads, but it is also at such times that radical technological changes take place, fresh patterns of work organization are introduced and new machines installed. It is hardly surprising that people tend to connect these two aspects and regard technology as the cause of unemployment.

Disregarding surface appearances, what is the true relationship between technical progress and the number of jobs available ? Many conflicting replies have been given. It is tempting to conclude that there is no definite answer, but it seems more sensible and more fruitful to accept that the relationship is contingent on historical circumstances and there is no immutable law linking the two variables. In every age there is confrontation between a range of technologies and a dominant form of social relationships and economic constraints. Today it is micro-electronic technology, or information technology, that is gaining a foothold in a crisis-afflicted society, the forms of which evolved with a different generation of technologies. The doubts, conflicts and disturbances caused by this confrontation are numerous and go far beyond the impact of the new technology on jobs and unemployment (1). And yet this issue is at the care of the discussions. The responses found, the methods used and the persistent questioning are significant of the issues at stake and the terms of the whole debate.

Rather than surveying the precise results available in the existing literature, we have preferred to concentrate on these methods and questions, while part 2 of the Bulletin contains summaries of various studies.

We shall first examine the specific features of the current debate : is it the new technology that forces us to put an old question in new terms or is it the social and economic context that has changed ? Perhaps it is the very relationship between technology and work that has changed and needs to be reconsidered ?

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(1) For a summary of the debate, see [6,26].

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After looking more closely at the constraint of competitiveness, universally acknowledged as a constraint on technological innovation, we shall study the methods used in the existing literature. We shall look in turn at analyses based on the firm and at micro-economic analyses. We shall draw conclusions on the issues at stake in the debate and on policies that could be adopted.

1. WHAT IS NEW IN THE "NEW TECHNOLOGY"?

How is it that new information technology is giving rise to unprecedented discussions about its impact on the economy, and in particular on employment ? Is it the technology itself that makes it necessary to review earlier conclusions (1).

There are two ways of tackling this question. The first is of an empirical nature and involves demonstrating that the new technology has already had harmful effect on employment. This is proposed, for example, by G. FRIEDRICHS [5]. However, it has not yet been proved that the technology factor is really at the root of this reduction in employment. P. STONEMAN and alii show convincingly that so far there is no conclusive evidence, that technical progress is responsible for the current unemployment levels [28].

The second method consists of listing the specific features of the new technology. The aim is to show that new information technology breaks with previous trends in technical progress.

In our view, it is J. RADA [16] that best represents and formalizes this approach. He proposes four specific characteristics of the new technology that can serve as grounds for unprecedented questions of an economic nature :

1. The nature of the new technology, which exercises "intelligent" functions and therefore competes more directly with man's most specific attribute and not merely with his physical strength as before ;

2. The speed with which these techniques are being developed and disseminated, mainly because of the impressive reductions in the cost of manufacturing microprocessors, the low marginal cost of these components and their versatility ;

3. The scientific nature of the discoveries leading to these innovations, unlike the empirical discoveries in earlier times ;

4. The development of these techniques on a world scale;

The last two points are the weakest : the fourth is not really new; while the third concerns the process of technological innovation rather than its economic use and therefore precedes the issue with which we are concerned here.

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(1) For example, those in the 1966 Report to President Johnson [17]

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The second point provides some justification for the concern arosen by the new wave of computerization and automation. The speed with which these technologies are being introduced is indeed likely to give rise to temporary imbalances because of differences in timing. However, it is not in itself sufficient to call into question the arguments predating the acceleration in the development and dissemination of these techniques.

There remains the first point concerning the intelligent nature of the new technology. This characteristic tends to make it a basically labour-saving technology jeopardizing the employment-growth relationship. With the use of this new technology, the number of jobs available would be more and more strictly tied to the volume of production. Some authors [16, 24, 27] put forward the idea that a revival of production would not affect the long-term tendency for employment to decline. The growth - productivity - employment triangle would be replaced by a direct relationship between technology and employment, with productivity merely being proportional to the volume of production.

Without attempting to predict the future, we must say that the signs of this happening in the future are scanty. This argument is based partly on an implicit extrapolation of a specific form of growth : the type we have experienced over the past 30 years, as far as economic and social forms are concerned, with a radically new technology. The probability of this scenario coming about is low.

The limits of an argument based solely on the specific features of the technologies are quickly reached. To supplement or contrast with this approach, the authors examine the new crisis economy within which the technologies are being introduced. It is then the economic and social context itself that is put forward to account for the new nature of the technology-employment relationship.

2. THE NEW ECONOMIC AND SOCIAL CONTEXT

Full employment no longer exists in the western countries despite their past record of 25 years of sustained and continuous growth and low unemployment. Since 1974 growth has been slowing down in all these countries and this has been accompanied by a large increase in the number of job seekers.

These apparent signs of recession have numerous causes that need not be listed and analyzed here. It should merely be borne in mind that the current increase in unemployment cannot be accounted for by a traditional mechanism of technological unemployment.

New information technology is being introduced on a vast scale in a period of mounting unemployment and economic difficulties. It is not the root cause of either of these phenomena but it is concomittant. Many more authors base their reasoning on this finding and not on a radical change in the effect of one technology on a given economic environment.

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Against this new economic background, technology, which leads to improvements in productivity, has an impact on employment different from the effects it might have had during the preceding phase of growth. This is true whatever the technology considered.

If a hypothesis of full employment is adopted, as was the case during the 1980s in Europe, productivity determines the permissible volume of growth. As BOYER and PETIT point out in their study on the subject (1) : when there is full employment, any gains in productivity promote growth, in particular by offsetting the shortage of labour and lessening inflationary pressures". To portray a situation of that kind, one considers a chain of causality which, starting from the jobs available and the feasible productivity increases, determines product growth.

Since the mid-70s, the logic of this chain has changed, and this partly accounts for the new nature of the questions now arising. In a situation of underemployment "of the Keynesian type", as BOYER and PETIT call it (resulting from the inadequacy of real demand), it is employment and not growth that is affected by increased productivity. Is that sufficient reason to call it "technological " unemployment? We shall see that the problem is by no means simple and is far more than a terminological dispute.

If the time of argument adopted by BOYER and PETIT is pursued with the European economies in their current state, the line of causality that existed during the period of post-war expansion would be inverted : demand prospects and productivity trends would now determine variations in employment.

This will indeed be the case if development and growth continue on their present lines. At first sight there appear to be two possible ways of getting away from this : to slow down the introduction of the new technologies or to reconcile the economic and social environment with the existing and future information technologies.

The impossibility of the European economies taking the first course is one of the rare points on which all agreed in the debate. It is universally acknowledged that the external constraint of competitiveness is a strong argument for the introduction of technical progress. This constraint, if it is justified, therefore influences that whole debate, over the way in which questions are put, as we shall see.

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3. THE ISSUE OF COMPETITIVENESS

In examining competitiveness, it is possible to distinguish two separate questions that are often confused [19]. This confusion obscures the discussion and the issues at stake.

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(1) BOYER and PETIT, Productivité et emploi : evolution recente et perspective, CEPREMAP, 1980.

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The first question can be asked in these terms : is the new technology reducing employment? Its significance is as follows : if we take a given initial level of employment, does the information technology introduced have the effect of reducing the level? The comparative reference of employment levels is here temporal and historic.

The second question is as follows : does the new technology safeguard employment? Its significance is as follows : is the level of employment at a given time greater than it would have been without computerization? The comparative reference here is instantaneous and alternative.

These two questions are not identical. Although the second can be answered in the affirmative by using the competitiveness constraint as an argument, this constraint cannot be adduced to resolve the first question, even though that has often been attempted. It is not possible to reduce the first question to the second.

And yet this is what S. NORA and A. MINC, for example [2], appear to be doing when they write that :

> "What effects massive computerization will have on employment depend on a balancing act, the outcome of a race between the reduction in manpower linked to increased productivity and the increase in markets resulting from a higher degree of competitiveness".

This idea of setting off growth against productivity by way of competitiveness is certainly one of the theories that has had the greatest success over the past six or seven years. It has had and still has an extremely strong ideological impact.

At least three criticisms can be made of this type of analysis :

- since all countries make the same circulation, it is not the absolute level of productivity that counts but the relative level of productivity increases ;
- an improvement in productivity, even if relative, does not necessarily result in an increase in foreign markets ;
- the question of the growth of nations cannot be boiled down to the distribution of a given quantity of work to be done at world level, a zero - sum game.

Here we shall merely make a few comments on each of these points.

Considering the first point, the question of relevance to Europe is whether the new technology will enable us to regain our competitive position vis-à-vis the rest of the world. In comparison to the other developed countries, information technology is being introduced at a pace and in a way that do not justify much optimism in this respect. It seems more a matter of maintaining Europe's competitive position than improving it, at least in the medium term.

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With regard to the second point it should be noted that, as the Lesourne Commission demonstrated in France, the argument that increased productivity is a sine qua non for the improvement of a nation's competitiveness, even assuming that price competition is the determining factor, is based on the hypothesis of the full use of the labour available. In a situation where unemployment is as high as it is at present, this hypothesis is anything but realistic.

At a time when the labour factor is being wasted, expenditure on unemployment benefit greatly weakens the logic of arguments that assume the full use of factors.

J. DE BANDT expressed similar views when he wrote that "increases in productivity are not a solution if the corresponding productivity surpluses have to be used to remunerate redundant manpower". And yet almost all the European countries at present find themselves in a situation of this kind.

The last point is the most important. The issue of the relationship between technology and employment is not only a problem for each of us but is also a universal problem. Consequently it cannot be resolved by nationalistic attitude of exporting one's own unemployment. The future growth of the world economy and the resultant unemployment will not by any means be solely a function of the relative competitiveness in developed countries. Although competitiveness is indeed a constraint in that it prevents us from merely discarding the new technologies, it is not a solution to the existing and future unemployment problem.

And yet can we accept the alternative proposed by H. AUJAC and J. DE ROUVILLE "either reduce employment by automation or extinguish it by insufficient automation" [19]? This is the real issue in the current debate.

Continuing our investigation, we shall now take a more systematic look at the various methods adopted to tackle the problem. We shall start with analyses based on the observation of firms.

4. ANALYSES BASED ON THE FIRM

In the debate two methods of microeconomic analysis can be distinguised : those based on the different types of applications of the new technology (numerically controlled machine tools, memory typewritter, robots, terminals, etc) and those based on the sectors in which these technologies will be introduced. Both approaches have a number of advantages and drawbacks.

The analyses which start from technical applications have the advantage of clearly defining the technological factor. This is clearly exposed, especially in the simulation studies often carried out by hardware manufacturers. However, this advantage can turn into a drawback if the results are made to say things they do not mean.

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As they isolate the technological factor, these studies are not capable of correctly taking into consideration social and organizational factors, or analyzing a production process as a whole. Since the weight of the technological constraint is pushed to its extreme limit, it is not surprising that the results are very pessimistic (1), or even alarmist. Nor do they take account of the wastage and the new uses made of hardware, which are particularly significant in the tertiary sector. In the final analysis, their value is to provide us with information on the limits of the impact of the new technologies on jobs. And we do mean jobs and not work. An automated job does not necessarily mean a loss of work. Workers whose jobs are affected are often moved elsewhere in the firm. Consequently it is not often that employment is directly reduced by the introduction of the new technology.

Sectoral analyses on the basis of real case studies are less open to the criticism of being too technical. In analyzing an economic situation in all its complexity, the technical factor is viewed in the context of a set of social and economic parameters that is no longer ignored. It is then the isolation of the "technical progress" factor that causes problems. This difficulty is nevertheless stimulating in that it is based on a fundamental fact : although technology influences work, work is not totally constrained by technology. The very delimitation of the degree of constraint that a technology exercises on the organization and the volume of work becomes one of the basic tasks in sectoral microeconomic studies.

Whatever their approach, however, there are limits to microeconomic studies. These are of at least three types. First of all, there is great theoretical uncertainty [6, 21]. Secondly, the indirect effects are poorly and inadequately evaluated. Lastly, future projections are simplistic and are not cumulative sector by sector because of a lack of understanding of the indirect effects and a failure to take into account background macroeconomic data. For these reasons, it is essential clearly to define the field of validity of such research. Microeconomic studies do not allow conclusions to be drawn on the overall effects or the net effects of computerization on employment [3, 11, 17]. Analysis based exclusively on case studies should therefore refrain from considering the net impact on employment. The study of these net effects is a matter for macroeconomic analyses.

On a micro-economic scale, the pertinent question to which the study should seek an answer concerns mobility. In tackling this issue of labour displacement following the introduction of new technology (for example between services and industry [6, 16]), these studies must consider the gross effect : how many new work places will be created and how many old ones abolished. Allowing for the firm's internal labour market, how many jobs will be abolished locally and how many created locally. The tools for case studies are far more suitable for this type of research than for the examination of overall balances.

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(1) For example, the results of the famous but invisible report by Siemens, Büro 1990, 1976, Munich.

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Better guidance will be provided for policies on training, education, retraining, aid for mobility, information for workers and even to a large extent aid for the unemployed by information on gross flow than by a knowledge of partial or overall net effects.

These net effects cannot be evaluated merely by drawing up a balance of the gross effects measured at micro-economic level. To evaluate them, we need a macro-economic reference framework which we can justificably risk passing over when we are concerned with gross micro- or meso-economic effects.

Arguments based on balances call for a knowledge of the economic environment that goes well beyond the question of technology (1). Finally, arguments conducted ceteris paribus are to a large extent sterile at a time of major changes such as today.

5. MACRO-ECONOMIC ANALYSES

The main function of macro-economic studies, which may be of a direct futurological nature, is to reply to the first question asked in Section 3 above : will the new technology reduce employment ? They also help to make progress on the question of competitiveness.

The methods used in the macro-economic approach are of two types : the first is quantitative and consists of building forecasting models based on the extrapolation of past trends. The second is qualitative and consists of constructing future scenarios; it is more speculative than the first one.

5.1 MODELS

The approach by way of models consists of deducing future developments from past quantitative macro-economic observations in accordance with a general logic of relationships, constraints and behaviours. In our case, the models use a complex set of relations to deduce future trends in the volume of employment and unemployment from a comparison of expected improvements in productivity and volume of production [11, 25].

Essentially, therefore, the results depend firstly on the mechanisms by which the model determines future productivity and product growth and secondly on the relations to which the model gives preference between these two variables. Four types of difficulties are encountered in building any model of this type [25].

1. Difficulties in demonstrating the connection between technical progress and employment. This link depends on the hypotheses adopted for the factors determining product growth, and in particular on the connection between technical progress and growth. This latter relation is one of the most controversial in economic science. It depends amongst other things on the way the external constraint is analysed. The nature of existing unemployment (classical or Keynesian) is in the same way vital for demonstration of the connection between technical progress and employment. Even less than any other approach, modelling for forecasting purposes cannot disregard theoretical analysis of macro-economic chain effects.

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(1) It is also necessary to take account of all the intersectorial relationships and substition phenomena between goods and services.

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2. Difficulties in measuring technical change. Macro-economic models deal only with the consequences of technical progress, the origin of which, in contrast to case studies, is not described. Consequently, these models adopt the hypothesis, which is open to criticism, of exogenous determination of technical progress (1).
Since 1973, when productivity trends in most western countries showed a break with the past, it has not been possible to predict future trends with certainty because of the lack of any consistent theoretical analysis of this change (lasting or transitory, etc ...).

3. Failure to take into account the factors determining technical progress. Inherently, macro-economic models do no more than extrapolate past trends in technical progress without concerning themselves with the origin of this progress. In the final analysis progress is only a function of time. Under those conditions, it is understandable that such models can contribute little to the study of a possible break in productivity trends resulting from a major innovation.

4. Failure to take into account possible upheavals in the economic and social behaviour of the various protagonists. The crisis can effectively be overcome only by calling into question existing institutional forms of production and consumption. The models, which are extremely conservative from this point of view, are powerless to consider non-linear developments of this kind.

Finally, the uncertainties about both the future macro-economic environment and the growth in productivity brought about by technical progress greatly jeopardize the results of macro-economic models. At a time when everything is being thrown into question as it is today it is often deceptive to try to interpret the future in the light of the immediate past. Significant breaks can occur at any time and existing models are incapable of predicting them and taking them into account. Beyond the short and medium term, only speculative investigation of a qualitative nature, although of course based on all the incomplete information supplied by the other methods of analysis already studied, holds out any hope of throwing light on the possible future.

5.2 FORWARD SPECULATION : ASKING THE RIGHT QUESTIONS

As A.B. CHERNS emphasizes, the new information technology offers choices [27]. These choices will depend on economic and social options. They will depend on the types of industrial economies, social values and structures and political regimes adopted in the countries concerned. As A.B. CHERNS also notes, we must widen the scope of our question in the field of interest to us and no longer merely concern ourselves with international competitiveness and the reduction of unemployment.

If we assume that past trends will continue it does indeed seem that new technology has the effect of reducing jobs and increasing unemployment. To change the trend it is necessary to call into question existing patterns, to reformulate and rewrite the relations between society, the economy and technology. Linear reasoning arrives at competitiveness as the only (partial) solution to rising unemployment. The formulation of future scenarios is then the only way of considering other possibilities and trying to ask new questions about the choices to be made [15, 16, 23, 26, 27].

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(1) For criticism see K. PAVITT, "Technical innovation and industrial development. The new causality", Futures, December 1979.

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Under present conditions, and according to the authors we are considering here, the first question that arise appear to be as follows : (We have classified the questions in two sets. The first concerns the organization of future society and the second the transition mechanisms).

1 - Is the main problem to manage underemployment or to create more work ? Is it necessary to work less or produce more ? [16, 26]

- If the total volume of organized work declines, how should it be allocated ? Should it be shared between everybody or should we move towards a dual type economy ? [15, 16, 26, 27].
- In the event of massive underemployment or a dual economy, what will the allocation mechanisms be ? Is it necessary to separate work and remuneration ? [16, 27]
- What will the new social requirements be ? Under what conditions will they emerge? Will they be met in a commercial or non-commercial fashion ? [23, 26]
- Will any extension of free time generate a new demand ? [26].
- What will the future demand for services be? What social organization should be provided for their production ? [23]
- What will be the social attitude to organized work ? [27]

2 - What relationship is there between technology and the crisis ? [23]

- What constraining value does a technology, and in particular the information technology, have on a work system ? (1)
- Are the obstacles put in the way of technical progress by economic and social structures a root cause of the crisis ? [23].
- What training policy should be implemented to overcome these obstacles ? Is this a training problem? [13]
- Should the social attitude to underemployment be modified and if so how ? [16]

These questions are not by any means the only ones that arise or that should arise at the present time in the analysis of the technology-employment problem. Therefore the investigation must be continued and as much as possible learnt about the range of possibilities through the construction of scenarios. What has been done so far in this field is inadequate and too scattered. Although analytical research is necessary, it cannot on its own provide an exhaustive answer and formulate proposals for desirable and efficient policies.

After this review of methods of analysis and their purposes, we shall end with a brief mention of the policies that can be adopted.

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(1) See A. d'IRIBARNE, paper read at the Journées Nationales d'Etudes DGRST-CEREQ-CNRS, December 1980. "Technologie et système de travail : l'évolution du travail face au développement des technologies".

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6. WHAT SHOULD THE COMPUTERIZATION-EMPLOYMENT POLICY BE ?

Once the protectionist alternative is discarded, a policy of obstructing the penetration of the new technology in the economic fabric would be suicidal, as we have seen, and would create even more unemployment than if this technology were freely introduced. This opinion is unanimous.

The existence of computer technology is a fact, it can no longer be called into question or its introduction manipulated politically on a worldwide scale. This statement does not mean that a general "do-nothing" policy is essential. Indeed a set of supporting policies is necessary at several levels.

Firstly, whatever the impact of technology on the overall level of employment, there will be very important microeconomic consequences, as case studies have shown. Policies of aid for mobility should therefore be conducted with the dual aim of making the workforce more flexible and gaining greater public acceptance of the need for mobility. This calls for a policy of explanation and information. However, it is also important to ensure that the advantages of computerization do not appear solely at macroeconomic level while the drawbacks are experienced solely by firms. A supporting policy of a more qualitative nature is therefore required.

This involves recognition of the right of workers concerned by technological changes to information and negotiation, provision of aid for mobility when necessary, the setting up of training plans, etc. It also involves a policy of aid for groups that are particularly vulnerable or already affected, in particular some women workers.

These qualitative policies are essential : full employment is primarily a situation in which job supply and job demand are matched. In a period of far(reaching change, this must involve mobility.

Secondly, the actual conditions for introduction of the technology must be defined. Technology offers choices : these must be fairly negotiated and all the parties involved must have the means to do so.

Finally, the problem of sharing out the available work is absolutely vital but, as we have seen, definition of the policy to be adopted is beyond the limited scope of this study.

In more precise terms, the actions to be taken must cover the following points (1) :

- procedures for negotiating the introduction of technology,
- extensive information for the workers concerned at an early date,
- establishment of a suitable education programme,
- extension of vocational training and wider recognition of qualifications,
- more specific aid and strenghtening of the position of affected and vulnerable categories,
- better understanding of the problem and the issues at stake,
- encouragement of joint research on the more distant future.

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(1) See Commission document V/593/81

CONCLUSIONS

There has been much discussion in Europe in rec nt years about the link between new information technology and the volume of employment. This debate arose from the current high unemployment level and the widespread introduction of the new technology.

Case studies cannot reply to the question asked but they are extremely useful in throwing light on the introduction of practical policies of mobility that are essential at times of radical change. Macroeconomic models are the main tool for analysis of the relationship between technology and unemployment. At a time of great uncertainty when the conditions of growth are constantly being called into question, their use for the medium and long term is not entirely reliable : it is difficult in a time of crisis to predict the future on the basis of the immediate past. Consequently the construction of future scenarios is the most valid method of asking more far-reaching, long-term questions concerning this relationship between technology and employment. By widening the scope of the questions, we give ourselves an extrachance of responding more adequately to future problems.

ANNEX.

In the annex we summarize a number of studies on the relationship between new technology and employment. This is a selection from the literature and does not claim to be exhaustive; we hope that no-one will be upset by the omission of some major study. Our intention is to propose a number of summaries representative of the current debate.

Many of the texts we have selected are not confined solely to the subject covered here. We have deliberately limited our summaries to those parts of the study that are directly relevant.

Some summaries are based on the author's abstract while some are modelled on existing analyses, in particular those in the ILO's Social and Labour Bulletin.

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National Commission on Technology, Automation and Economic Progress

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Technology and the American Economy, February 1966.

The Commission which produced this report was set up in 1964 at the request of the President of the United States and of Congress, because of the persistent unemployment in the United States from 1954 to 1965 and the very widespread belief that technological change was a major source of unemployment.

The report refers to a time scale of 10 years. It covers a very vast field, much wider than the relationship between technology and unemployment. Although very extensive technological changes took place in the United States during the "fifties", the report says that they could not in any way be regarded as the cause of the high level of unemployment during that period. Unemployment is the result of the interaction between substantial improvements in productivity, the increase in the workforce and an inadequate growth in overall demand. This pattern is confirmed by the way the economy reacted to reflationary policies.

On the other hand, although technology is not responsible for the overall rate of unemployment, it is a contributory factor to certain forms of specific unemployment and labour displacement. The report distinguishes clearly between these two aspects of unemployment. It is technological change, amongst other contributory factors, that determines the places at which unemployment emerges; however, the general level of the demand for goods and services is a far more important factor in determining the overall level of underemployment. It is true to say that technology abolishes jobs, not work.

Economic policy has to stimulate demand alongside potential improvements in productivity. Without such a policy, technical progress leads to waste and unemployment. However, the variable to be influenced is product growth and not productivity. To inhibit technical progress would have disastrous consequences in the long run for the American economy.

In the past, improvements in productivity were obtained partly by growth in incomes and partly by reducing working hours. This pattern should be continued in the future.

To end the section of the report devoted to unemployment, the Commission states that the high level of underemployment is due to the passive attitude of the authorities and not to an excessively high pace of technical progress. General tax and monetary policies and a suitable labour policy, especially as regards training, should bring about a return to full employment.

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S. NORA and A. MINC

The computerization of society

La Documentation Française, 1978.

Report to the President of the French Republic on ways of managing the computerization of society.

The report is not primarily concerned with employment but this issue is nevertheless tackled in a way that has influenced the debate, especially in France.

> "What effects massive computerization will have on employment depend on a balancing act, the outcome of a race between the reduction in manpower linked to increased productivity and the increase in markets resulting from a higher degree of competitiveness. The first effect is definite and short-term; the second is subject to conditions and will make itself felt more slowly".

This sums up the author's attitude to employment. Their view of the future of employment is pessimistic; they predict an end to the creation of jobs in services and a standstill in the industrial labour force. They expect a jump in productivity in the service sector comparable to the earlier gains in agriculture and industry.

The monographs predict a 30% reduction in labour in banks and insurance. Employment is also likely to decline in social security, postal services and offices.

In industry, computerization will be introduced more slowly ("tertiary" activities of industry and robotics, etc.). The recruitment of administrative staff and production personnel will stop in large companies. "The only industrial jobs created from now on will be in small and medium-sized businesses".

BATTELLE INSTITUTE

Der Arbeitsmarkt in Baden-Württemberg - Technologische Entwicklungen und ihre Auswirkungen auf Arbeitsplätze in den Bereichen Maschinenbau und Feinmechanik/Optik

Battelle, 1978.

According to Battelle experts, it is impossible to draw up an employment balance by quantifying the favourable and unfavourable effects, at any rate with the knowledge available at present.

For the horizon taken for the projections in the report (1990), the results of the survey do not give any indication of a future development of an abrupt nature. Consequently no employment dump caused by technology seems likely.

In the machine tool industry, 14 applications of the new technology have been studied. The labour savings in this sector as a result of the development of these technologies have been estimated at 5% of total employment. On the other hand, the jobs created through these technologies cannot be quantified. Also, a great increase in labour skills is predicted.

In optics and precision engineering, 15 applications of the new technology were studied. The results are similar to those obtained in the machine tool industry. A 6% saving in jobs is expected, the jobs to be created cannot be quantified and the Institute predicts an increase in skills.

CENTRAL POLICY REVIEW STAFF.

November 1978.

Report based on a number of cast studies covering nine sectors of industry and services. Half of the paper is devoted to employment.

Great caution must be exercised in any predictions of the effect of microelectronics on employment. Four main reasons are put forward :

(a) The applications rarely involve the straightforward replacement of labour by microprocessors. Generally the main reasons are to reduce the level of stocks and save on raw materials and energy, to improve quality and reliability and to obtain better information for control purposes or to overcome technical problems.

(b) The applications, especially on the services side, often lead to possibilities of creating or improving services which were not originally planned. That will reduce the tendency to cut back on staff and might even reverse it.

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(c) Microprocessors are generally introduced as part of an automation or mechanization process. The main changes that result do not necessarily affect the number of persons employed but the organizational structure and range of products.

(d) The penetration of microprocessors in products and production processes is far less advanced than is generally thought. Far from being imminent, as has sometimes been suggested, the technological changes in most industries will be gradual rather than revolutionary and the effects on employment will be sufficiently slow to be predicted and allow adjustments to be made.

Gunter FRIEDRICHS

Microelectronics - a new dimension of technological change and automation

Report to the Club of Rome
Berlin, October 1979.

The Friedrichs report concentrates on the applications of the new technology that will have substantial effects on employment. It is based mainly on studies carried out in Federal Germany.

With regard to industrial production, the author shows that the extensive losses of jobs from 1970 to 1977 were suddenly aggravated after 1977, the year in which microelectronics made its appearance.

The prospects for administrative and office jobs up to 1990 are bleak, mainly because of the introduction of electronic word processing.

In the medium term, the other sectors could not offset the losses of jobs caused by the introduction of new microelectronic technology. Consequently an overall reduction in employment must be expected at a time when unemployment is already high. From 1970 to 1977 the output of German manufacturing industry increased by 13.5% while employment declined by 14.5% and the volume of work by 21.3%.

In the long term, the only hope of seeing a reversal in this trend lies in the consumer sector.

"In the very long term, microelectronics offers ... improvements in quality so great that demand will be increased and entirely new products created, which will without any doubt provide new jobs. However, there will be considerable time lag between the period when the use of microelectronics is dominated by process innovations and the time when product innovation starts to gain ground".

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Institute for Research on Public Policy

The impacts of computer-communications on employment in Canada - an overview of current OECD debates

Montreal, November 1979.

A survey of some 400 documents from many sources on the effect of the new information technologies on employment. The report shows how little foundation there is to existing studies, half of which are by pessimists (often with a trade union background) and the other half by optimists (who tend to be on the employer side).

The report points to the inadequacy of existing quantitative analyses which take into account neither the new industries set up nor intersectoral links. The theoretical bases are weak and not very explicit.

According to the Canadian study, the documents examined reveal deep disagreement about the net overall effect on the level of employment. There is, however, a general consensus on the harmful effect of numerically controlled machine tools and word processors. There is also agreement on the seriousness of the effects in different sectors of the employment market. Older persons, unskilled workers, middle management and above all women will be affected. It is necessary to examine the influence of new technology on current unemployment levels.

Despite the hazards of aggregated statistics, the Institute has endeavoured to investigate in greater detail the technological and economic changes that have had an effect in certain sectors. The few practical situations examined turned cut to be completely different from what would have been expected on the basis of the documents studied, which themselves were based on aggregated statistics.

The report concludes with the need to intensify macro-economic research according to the following principles :

1. to admit our ignorance of this very complex phenomenon
2. to accept that there is no reasons why man should not be replaced by machines
3. to draw up different scenarios of the impact of microelectronics on employment (ranging from the most favourable to the most unfavourable hypothesis), each based on explicit hypotheses concerning the pace with which microelectronics will spread, the international transfer of technologies, capital requirements social adjustment, etc.
4. to examine these scenarios within the framework of a model
4. to have the nature and pace of the spread of the new technologies studied by a team of experts.

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A.S.T.M.S.

Technological change and collective bargaining

A discussion paper, London, 1979.

The trade unionists who wrote this report fear that the creation of new jobs will not keep pace with the abolition of jobs by the introduction of microelectronics. Whatever measures are adopted, extensive future unemployment is to be expected. The estimates come from other report; it is predicted that between 10 and 30% of workers will be displaced as a result of the use of computers.

On the basis of government predictions on the labour supply in 1985 and 1991, the authors estimate that by 1985 50% of the total labour force will be working in the information sector, and at least as many in 1991. By 1985 20% (and by 1991 30%) of workers will be displaced as a result of these technologies. Overall the study predicts 15% unemployment in 1985 and 20% in 1991.

Whatever the hypotheses adopted, the authors show that the scope of potential unemployment cannot be denied. Consequently the first priority for the unions is to protect employment. The A.S.T.M.S. proposes a number of measures intended to share the burden of the future work shortage as fairly as possible : reduction in working hours by all possible means. In addition it is necessary to maintain a minimum income for everyone.

A.P.E.X.

Office technology : the trade union response

London, 1979.

The union working party notes that, even if the only effect of the introduction of the new microelectronic technologies is to put a stop to the growth in the number of office jobs, there will be an increase in unemployment. It points out that most female jobs are in offices.

The union does not intend to oppose the introduction of the new technology, however, if it were not introduced, the effect on employment would be even worse. Nevertheless serious action must be taken to avoid widespread unemployment.

The report proposes a number of measures to prevent this large increase in unemployment, in particular negotiations with employers.

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F.I.E.T.

Effects of rationalization on the employment situation in the European commercial sector

Geneva, 1979.

This report stems from a survey conducted by the F.I.E.T. in 1979 amongst nine European trade union federations. The level of unemployment in European countries at the time of the survey is viewed in the context of the gradual introduction of the new technologies (electronic data processing, video display units, word processing, etc...). This comparison shows that there is a high risk of increasing unemployment in a sector that is already affected (Federal Republic of Germany, Italy and Belgium in particular), especially with regards to jobs for women.

A world action programme has been set up.

T.U.C.

Employment and Technology

London, 1979.

The aim of this report is to prepare a union strategy. It briefly analyses job prospects following the introduction of the new technology.

Tha largest job losses in manufacturing industry have been suffered by unskilled workers. Technical progress is likely to accelerate this trend. On the other hand, there will be a need for more technicians, engineers and scientists.

Women will be particularly affected. They are already suffering more than men from unemployment. This is because of the limited choice of jobs open to women. Policies are required to break down existing barriers, in particular reforms in the educational and training system and in child minding arrangements.

A growth of at least 3% is necessary to reduce unemployment. Nevertheless it is difficult to predict the net effect of the new technologies on employment. Existing forecasts are contradictory and are based on projections of past trends. According to the T.U.C. economists, the impact of these technologies will be precisely to prevent these past trends from continuing in the future. They reject the deterministic view that the advent of microelectronics will inevitably be associated with a certain level of unemployment.

On the one hand, the creation of jobs will depend amongst other things on the level of demand, the pace at which the new technology is introduced and the behaviour of competitors. On the other hand, the abolition of jobs may be more sudden and more concentrated than the creation of jobs following the development of new products. According to the authors, the overall result will depend above all on the behaviour of the two sides of industry.

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Nevertheless, the report states that the deflationary policy conducted by the government creates the most unfavourable conditions for the introduction of the new technology.

Finally, the T.U.C. emphasizes the need for more detailed studies on the practical consequences of technical progress.

J. SLEIGH, B. BOATWRIGHT, P. IRWIN

The manpower implications of micro-electronic technology

Department of Employment
London, 1979.

This is a report by the Manpower Study Group on Micro-electronics set up by the Ministry of Labour to examine the consequences on labour of micro-electronic technology up to 1980. The report focuses mainly on the British case and the difficulties in the way of competitiveness experienced by its economy.

The approach selected was to carry out a number of case studies. Consequently the authors admit that they cannot give an overall prediction of the volume of employment since that depends on micro-economic hypotheses which are outside the scope of the framework they have adopted. No scenario has been given preference in this study by the authors recognize that the United Kingdom has no choice whether or not to adopt the new technology. Its use will not solve the country's economic problems; in the authors' view, there is no technological determinism, whether optimistic or pessimistic. In addition, contrary to what some have said, it appears that the introduction of the new technology will be gradual and continuous rather than sudden and revolutionary. The models generally built to predict future employment trends with the introduction of the new technology suffer from inadequate clarification of the relationship existing between macro-economic and technical factors and between the various sectors. According to the authors, the behaviour of decisionmakers will be vital in the future. The overall effect on employment will depend on the objective followed by investors, to increase production or to reduce labour costs.

In manufacturing industry, the growth in demand will be more significant for employment trends than will technology. Only the question of competitiveness is important. To benefit from the favourable effects of the creation of new products, British industry must adapt. Consequently the new technology gives it an opportunity to reconstruct a more competitive industrial sector and thus to win back markets. So far this adaptation has not come about.

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The report reviews the action taken by the unions to negotiate the introduction of the new technology. It emphasizes the need to keep the unions informed and proposes a number of practical supporting measures, considering that the principles of non-interference are inadequate to ensure growth and full employment in Europe.

David TAYLOR

Cheap words ... ?

Youth Aid, London, October 1979.

According to this report, there were almost 9 000 word processing machines in the United Kingdom in 1979. According to market growth estimates made by various manufacturers and consultants, this number should increase annually by 15 to 40%, the figures varying from one author to another.

In view of the uncertainty on the subject, Taylor proposes only one possible scenario. Nevertheless, even taking the most optimistic figures, he speaks of a loss of more than 36 000 jobs by 1989. The most pessimistic figures indicate a reduction of 260 000 jobs.

The author does not accept any of the possibilities put forward for offsetting this loss of jobs. He quotes 10 case studies which all conclude that jobs will be lost by the introduction of word processing machines. Women will be the first to be affected by this new technology. The problem is all the more serious in that a relative and absolute increase in the female labour force is predicted. Nevertheless this trend will be progressive, leaving time for thought and for society to adapt.

European Trade Union Institute

The impact of microelectronics on employment in Western Europe in the 1980s

Brussels, 1979.

This very extensive report covers the whole issue of labour and the new technology. It tends to be pessimistic about the quantitative problem, predicting a future increase in technological unemployment. There is no automatic mechanism to create new jobs to replace those rendered obsolete by technology.

One of the major effects of this technology has been felt in industries where mechanical or electromechanical components have been replaced by microelectronics components.

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One important conclusion of the report concerns geographical shifts in employment as a result of microelectronics. There is a tendency for much of the value added and with it many jobs to shift to component manufacturers. This means that employment is tending to be displaced from Europe to the United States and Japan.

The report points out that product innovations have a greater impact on employment than process innovations. This point appears to be specific to this paper; at all events it is rarely mentioned.

Services will be particularly affected, and consequently women. From a sectoral viewpoint, the report predicts a reduction in employment in agriculture, mining manufacturing, transport and communications and finance. The situation will remain stationary in public services and construction while employment will increase in personal services and the restaurant and hotel trade.

Because of the international competition in Europe, countries which are the slowest to adopt the new technology are likely to suffer a greater wave of redundancies. It is not possible to dissociate technology from the overall economic situation in order to predict the real level of employment. From this point of view information technology is being introduced at a bad time.

In the services sector, "capitalization" has become possible with the reduction in the prices of electronic systems. However, although technology allows integrated "electronic offices" to be set up, there are economic reasons and social behaviours which militate against their advent. The theoretical improvements in productivity are by no means fully achieved in practice. Consequently the net result of the computerization of services on employment is not clear.

The example of Japan shows that it is possible to reconcile the rapid and complete introduction of microelectronics with reasonable employment safeguards. It should be noted that the introduction of the new technology has been easiest where there are non-redundancy agreements. However, consultations between the parties concerned are essential to the smooth introduction of these techniques. In Britain, the unions will nevertheless have to make more concessions, in particular as regards demarcation lines, in exchange for job guarantees.

The report is sceptical about work sharing as a way of fighting unemployment. The question of skills has not so far been a real constraint on the introduction of new technologies, but problems can still emerge. It is fallacious to believe that a vast training programme will make the country more ready to innovate; responsibility for training must remain in the hands of firms.

The recommendations emerging from this tudy, on the whole optimistic, are as follows :

- 1) A watch must be kept on developments in the company, especially where computerization is introduced, with a special eye to trends in industrial relations.

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- 2) Greater attention must be given in future studies to factors leading to the introduction of technologies that result in a substitution of capital for labour.

- 3) The effects on employment of the introduction of the new technology must be recorded.

- 4) Studies on training requirements must be continued.

- 5) Special attention must be paid to office automation.

- 6) Experiments with office automation in public services must be encouraged.

- 7) Training organizations must be encouraged to take microelectronics into account.

E. BIRD, S. CONNEL.

Information technology in the office : the impact on women's jobs

Equal Opportunities Commission, 1980.

Study on the effects on women's jobs (mainly secretaries and typists) of introducting new technology in offices.

On the basis of case studies, expert opinions and a review of the existing literature, the paper analyses these consequences up to 1985, and sometimes 1990.

According to the survey, 21 000 jobs for secretaries and typists are likely to disappear by 1985 (2% of the total) in the United Kingdom. For 1990, the most pessimistic scenario foresees 170 000 jobs abolished. In addition the demand for unskilled office jobs will decline sharply, unlike that for skilled jobs, the number of which should increase.

This dual trend will have two consequences :

- fewer jobs for women and more for men,

- need for extensive vocational training.

The study analyses in detail both the new jobs offered (description of content) and the training requirements.

The text is well documented and based on a large number of case studies. Results are obtained and lines of research traced out. However, so far the new technology has had little impact on equality of opportunity between sexes.

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A. DANZIN, A. BOUBLIL and J. LAGARDE

La société française et la technologie

Commissariat Général au Plan, La Documentation française, Paris, 1980.

This report deals with subjects far wider than employment and computerization but it contains some interesting considerations on our subject.

The working party headed by Mr. A. DANZIN first emphasises that a high level of unemployment could seriously affect the general public's willingness to accept certain forms of innovation, especially as regards productivity.

It is mainly in the services sector (the electronic office) that technology may be expected to have significant effects on productivity and hence on employment.

Deliberately viewing the problem against the background of an open economy, the working party urges that improvements in productivity offer France the best opportunity of preventing the geographical displacement of certain activities; it is an essential factor in competitiveness. Greater productivity at low price means a higher consumption capacity and eventually less unemployment.

However, to avoid being engulfed in "productivism", it is proposed that efforts be focused on three points :

- 1) developing as a matter of priority new branches of activity making better use of the skills of the French labour force ;

- 2) extending the concept of productivity to the reduction in certain critical consumptions;

- 3) starting up domestic production in order to reduce imports.

Aspirations concerning the quality of life together with the availability of certain new technologies may give rise to new types of consumption which themselves will create jobs. The free time made available by the reduction in working hours will probably have the same type of effect.

To offset "productivity unemployment", the group proposes two extreme scenarios : a dual society with an exposed advanced sector and a sheltered archaic sector, and a society in which work is shared, with a great reduction in organized work and rearrangement of working hours.

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J. RADA

A tentative appraisal of information technology

ILO, Geneva, 1980.

Information technology is different in quality from previous technologies. From many points of view, it is similar to the functions exercised by human intelligence. This denotes a break in the progress of human discoveries and accounts for the specific nature of the new information technology. Like the human mind, this technology is universal.

Two requirements are met by this technology : firstly, the processing of an ever-increasing volume of information and secondly, and above all, the need to increase productivity in office work and services. Economic growth can no longer be achieved solely by increasing productivity in agriculture and industry. What is more, because of the fall in prices of components and the versatility of micro-processors, their introduction is going ahead at a very fast pace. However, some factors are slowing down this penetration (depreciation of older equipment, for example).

From a socioeconomic aspect, the most important short-term effect concerns employment. The problem must be examined against the current background of low growth prospects, the changeover to new forms of energy, the increase in the working population, inflation, recession and a high level of unemployment.

The first sector to be affected both quantitatively and qualitatively will be office work and services. This means that women will be extensively involved. Industry will be less affected because it already has a relatively high level of productivity. Even there, however, employment will be substantially reduced. Although the introduction of technology generally leads to a reduction in the quantity of capital per unit produced, it greatly increases the capital-labour ratio.

The new technology has two simultaneous effects on employment : the displacement of tasks and the reduction in job creation potential. These two effects bring about an overall decline in the jobs on offer. Electronic products are basically labour-saving. Even a large increase in the output of new products will not affect the long-term trend. Most of the time there is no need for new distribution channels or maintenance services.

Daunting methodological problems arise in any attempt to make a quantitative assessment of the effects on employment, because of the lack of suitable methods and the difficulties in isolating the technological factor. According to available data, however, it is clear that a substantial loss of jobs is taking place and that this trend will accelerate in the early 1980's. These prospects are consistent with the historical tendency for employment to fall in agriculture and, more recently, manufacturing industry. It is now the turn of the services sector.

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There seem to be signs of a gradual changeover from a society familiar with unemployment to a society in which the full labour force available is no longer required to produce the necessary goods and services. It is doubtful whether early retirement, reduction in working hours or the development of new products and services will have much effect on job creation.

In the long term these changes will bring about modifications in social mobility. The conditions for the distribution of incomes will have to be reviewed in a context in which a large part of the population will work little or not at all.

Mr. RADA then goes on to the effects of the new technology on the international division of labour and draws economic consequences for the developing countries. The main point is that computerization reduces the present advantage of the developing countries in the way of low wage costs. The automation makes it possible to return to the developed countries a number of industries that had moved away or to slow down or put a stop to any future displacement.

D. COCKROFT

New office technology and employment

International Labour Review, vol 119, n°6, 1980

In view of the current expansion of microelectronics and its office applications, the author wonders whether employment in the tertiary sector will continue to grow in industrial countries. The use of computers is spreading rapidly in offices as a result of the large price reductions. The productivity of office working, a sector in which up to now investment has always been low, is increasing rapidly while production is stagnating.

According to the author, traditional economic relationships do not describe this situation adequately, while case study work cannot answer questions about the overall employment effects of technical progress. It ignores the positive effects of labour displacement on job creation and the fact that the improved competitiveness at one point may produce job losses elsewhere. Case studies do allow us to estimate the range within which technology can affect employment. The most important factor bearing on the rate of assimilation of new processes is the balance of costs and benefits arising from office investment. Other factors may also play a part.

Technically, if voice recognition by computer becomes an economic proposition, the need for typists could disappear completely.

The unions are trying to facilitate the process of adaptation but the economic and labour policies followed by governments and the attitudes adopted by employers will have to change significantly if an increase in technological unemployment in the medium term is to be avoided.

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APEX Automation and the office worker, Report of Office

Technology Working Party, March 1980.

The second Chapter in this tudy is devoted to the quantitative consequences of the new technologies on employment.

To remain competitive, industry must adopt the new technology but, in the event of a "do-nothing" policy, the new technologies will abolish more jobs than they create and it is young and old workers that will suffer most. The fields in which microelectronics will increase jobs (computers, electronic engineering, qualified technicians) have nothing to offer to unskilled young people.

The decline in manual and routine office work as a result of the combined effect of microelectronics, advanced data processing and telecommunications will aggravate the situation. Those most seriously affected will be filing and mail clerks, people engaged on collecting, classifying and transcribing information, cashiers, printing and reproduction workers, typists and secretaries and middle management.

The study discusses the macro-economic work by WOODWARD (Cambridge) based on the economic model of the Ministry for Industry, according to which the new technologies will abolish 880 000 jobs between 1980 and 1983. According to WOODWARD, the largest reductions will be in manufacturing industry (270.000 jobs abolished), retailing (160 000) and public departments (150.000). In occupational terms, office staff and secretaries will be most affected with 590 000 fewer jobs. The category consisting of directors, managers, liberal professions and technicians is the only one for which microelectronics will produce more jobs. Employment should increase by 8 %, i.e. 40 000 extra jobs.

On the basis of the work done by Arthr D. LITTLE on job creation, according to which 1 million new jobs will spring up as a result of microelectronics in the main producing countries, the study concludes that this will lead to only 10 000 new jobs a year.

APEX is convinced that if current practices are continued the overall result on employment will be negative, at least over the next five years, for five main reasons :

- Any substantial improvement in productivity at a time when production is stagnating or declining will be at the expense of labour,
- The office sector is labour intensive and employs more than one third of the total workforce. This sector will be particularly vulnerable in the next five years,
- In all cases known to the union, employers regard the new technology as a way of cutting employment in offices,
- The development of new industries in the United Kingdom has been slow compared to the United States, Japan or Federal Germany.

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- Even if these new industries were to grow faster than in the past, the number of jobs created by the new investment will be well below the jobs lost as a result of the use of electronics.

For APEX, the reduction in the working week offers at least a partial solution : there should be a 30-hour four-day week, restrictions on overtime and a reduction in working life. APEX sees this as an essential condition for technology agreements.

Even then, only 40-75 % of the net reduction in working hours would result in a larger supply of jobs. APEX recommends more active intervention by the state and the European Community to encourage job creation, work sharing and training for redundant workers and the unemployed.

H. AUJAC and J. DE ROUVILLE

Automatisation industrielle et emploi

BIPE, 1980.

The BIPE study, which is concerned with the quantitative aspect, centres on the statement that "automating undoubtedly abolishes a number of jobs but failure to automate may ruin French industry and bring about widespread industrial unemployment".

Consequently there are two questions underlying the study :

- does automation reduce employment ?
- in the final analysis, is not automation one of the best ways of safeguarding industrial employment in France ?

The method of case studies was adopted. The results of the surveys are presented individually with details in the study report. The two questions are then tackled in turn.

The author's reply to the first question on the basis of the surveys is "without any doubt, but the share that can be attributed solely to automation is smaller than is generally thought". Automation is rarely the only factor involved in modernizing a product line; it is generally accompanied by other investment and an increase in production capacity. The manufacturing labour force may be reduced by as much as two-thirds, but it is already small in relation to total labour.

The reply to the second question is on the whole affirmative. This is because automation is one of the only ways of maintaining competitiveness.

The alternatives are therefore clear : "either reduce employment by automation or extinguish it by inadequate automation".

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In the light of these results, the proposals for action are as follows : speed up automation in French firms, provide job opportunities for the redundant personnel through industrial diversifications, which should be encouraged by the authorities. The authors point to Sweden as an excellent example.

Y. DUPUY

Informatique et emploi

Commission of the European Communities, 1980.

Amongst the applications of computing there are process innovations and product innovations. Process innovations help to bring down production costs in the user industries. This applies mainly to unit labour costs. Product innovations result in the launching of new products on the market.

Process innovations have so far various effects on the total volume of employment.

- Moderate increase in employment in hardware manufacturing industries.
- Large increase in employment in the computer departments of firms, although this trend appears to have passed its peak.
- Numerous losses of unskilled jobs in firms using computers.
- Transfer of employment from the secondary to the tertiary sector, in line with a tendency to commission services outside the firm.

Data of a more macroeconomic nature confirm that the redistribution of employment following the development of production by branch as a result of the variation in relative prices will be slow. It does not seem that many jobs will be created in this way in the next few years.

Overall, the employment balance appears to show a deficit. The value of this balance should not be overestimated. The accuracy of the figures masks a whole series of hypotheses on the market trends and the pace at which innovation will be spread. The replacement rate of technical capital and the share of profits ploughed back are variables which are bound to have a crucial effect on the selection of the production techniques used.

To blame data processing for job reductions may well distract us from seeking the true causes : wage differences from one country to another, growing scarcity of raw materials, increased competition from manufacturers outside Europe. It is less important to calculate the number of jobs abolished by the use of computer hardware than to investigate the type of comparative advantage that computing gives Europe in the new international division of labour.

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Together with miniaturization, computing is opening up a new phase in product innovation and is becoming available for mass consumption. In view of the existing geographical structure of the electronic components industry, which will play a leading role here, there is a danger that in Europe the development of these products might not result in the creation of jobs to make up for these lost in the declining industries. Consequently it is less important to organize social monitoring of technical progress with the aim of slowing down the modernization of certain processes than to gain a firm foothold on a market that has a great future : minicomputing.

O. PASTRE

Informatisation et emploi : de faux débats autour d'un vrai problème

1980.

PASTRE wants to show that, regardless of a number of fallacious debates arising from a lack of methodological rigour of the part of the authors (especially of surveys), a pertinent analysis of the consequences of computerization on employment in quantitative terms is possible.

In general, surveys are divided between optimistic authors (who conclude that jobs will be created) and pessimistic authors (who conclude that jobs will be lost). The two tendencies do not necessarily conflict; the authors are generally talking of different things in different places and at different times.

Any quantitative analysis of the effects of computerization on employment is bound to come up against difficulties. First of all computerization is not an exogenous phenomenon and therefore it is dangerous to try to isolate it : "the identification and analysis of the variables influencing computerization procedures must be regarded as top priority in this field". Secondly, the degrees of freedom in the use of computers are numerous and rule out the possibility of excessively mechanistic reasoning : on the one hand, there is a wide variety of hardware and on the other hand, the use made of the same hardware may vary, so that different types of work organization are possible. Finally, there is a formidable methodological problem : the framework of the research is often heterogeneous with different hypotheses.

The author demonstrates the existence of artificial debates concerning methodological questions. It is first of all necessary to draw a clear distinction between effects on jobs and effects on employment as such. Three corrections have to be made in order to :

1. take account of the creation of jobs,
2. take account of the enormous wastage capacity of computing (under-utilization),
3. take account of redeployment within the organizations themselves and of the creation of new functions.

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Once these effects are taken into account, computerization appears to be less an economy of unemployment than an economy of mob lity. Although computerization will abolish large numbers of jobs (most studies reach this conclusion), it will above all lead to shifts in jobs.

What is more, the studies take little or no account of the indirect effects. Case studies, for example, exclude indirect effects by their very nature. And yet just as investment has multiplying effect on production, there is a multiplying effect on employment, but this may be positive or negative.

The horizon studied is also very important and greatly influences the conclusions. For example, new products, the emergence of new markets, and the modification of a competitive position make an appearance only at a later stage. It is in this sense that unemployment is sometimes regarded as "long-term investment".

Apart from problems of methods, account must also be taken of the fact that the studies may apply to different places or periods.

The problems do indeed take a different form in different countries (for example, there is no debate on the subject in the United States). Above all, the break with past trends studied by those who are trying to ascertain the new effect of computer technology on employment is not merely technical (microelectronics), but is also or even above all economic (crisis). The relation to be studied is therefore two-way :

- what is the role of computing in overcoming the crisis (new consumption, improvements in productivity, etc.) ?
- what are the effects of the crisis on computerization and its consequences on employment ?

To conclude, the author shows the need to ask a preliminary question : why and how are we computerizing ? What is technical progress? "So much has already been written on the social and cultural consequences of computerization and so little on the actual dynamics that are at the root of this phenomenon", he says.

CGT - Centre Confédéral d'Etudes Economiques & Sociales
Note éco. nO 184. May 1980

L'automotisation de la production : premières réflexions

The text covers automation in general but examines only its introduction in industry.

Taking up the traditional analysis of monopolistic state capitalism by the French Communist Party, the CGT stresses the difference, which in its view is fundamental, between automation of services and automation of industry, this division being based on the nature of the work : productive or non-productive (added value).

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Although automation of non-productive sectors allows incidental production costs to be reduced, automation of productive sectors must lead to an abrupt reduction in profit rates (cutting out human work) and is therefore incompatible with capitalism. However it is being introduced selectively and locally on the basis of semi-automation, the consequences of which on employment are here analysed in fairly great detail with a few general themes :

- The general trend observed is a separation between operations that can and cannot be automated. The disparities between the two are a source of contradiction.
- Automation introduces a very great flexibility of organization, both in the design and in the selection of products.

According to the CGT, the main impacts to be expected on employment, in both volume and quality terms, are :

- a reduction in labour directly assigned to production, capital-labour substitution and increases in productivity,
- an increase in jobs concerned with design, organization and maintenance of production,
- most of the loss of employment is of an economic rather than a technical nature : in France, the strategy of international specialization and the policy of market slots,
- the current pace at which the new technology is being introduced does not seem adequate to overcome the crisis and therefore resolve the unemployment problem;
- as far as skills are concerned, two trends are analysed : a trend towards homogenization as a result of the unification of man-machine relations and a tendency towards a greater intellectual content in production work.

The first trend is likely to downgrade certain specific jobs, to increase mobility and vulnerability of jobs in general and to affect certain occupational guarantees.

The second trend will shift qualification criteria from a gestural to an intellectual level; it may give rise to problems in training and retraining and the recognition of skills, and lead to massive deskilling.

- The CGT lays emphasis on the tendency of large firms to subcontract a number of tasks related to the new technology (design, maintenance and all tasks that are not of a regular nature) and points to the dangers of this trend with regard to the common safeguarding of working conditions and employment, and the workers' right to a say in the organization of work.
- As far as working conditions are concerned, much emphasis is laid on the risk of the worker losing control over the machine and the possibility of workers adopting a hostile attitude to the machine as such. The possibility of extreme individualization of work and destruction of worker's groupings is also stressed.
- Finally the paper touches upon the neglected question of the consequences of automation on forms of wages (abolition of efficiency wages, general wage policy, etc ...).

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The strategies emerging from the analysis in the way of union action are :

- overall, there must be greater planning and a reduction in working hours, resistance to the introduction of shift working, and an increase in real wages ;
- the introduction of the technology must be monitored and action taken at the design stage ;
- the question of skills must be tackled in terms of collective skills and the subject of versatility reconsidered ;
- united and interdependent workers'groupings must be built up again on new bases.

GASPARD M.

Mutations technologiques et emploi à travers la crise

Travail et emploi, No 7, 1981.

Does the machine create more jobs than it destroys ? The reply to this question is complex and variable : it is contingent on historical circumstances.

The text starts by outlining the long history of the relationship between technology and employment. In actual fact few new ideas have been expressed in the 20th century; most go back to the ideological beginnings in the 19th century and the social struggles that followed. The debate flares up again whenever there are serious economic difficulties. A parallel may be drawn between the depression of the thirties and Taylorism-Fordism on the one hand and today's recession and the information technologies on the other.

What relationship is there between technology and depression ? Are economic and social changes simultaneously a condition for the dissemination of new technologies, a condition for recovery and a condition for a return to full employment? These questions can only be asked at a macro-economic and macro-social level.

In France there has been since 1974 a decline in industrial employment and a growth in the tertiary sector. Although a clear link can be established between automation and productivity in industry, the same is not true in the services where the concept of productivity is much less clear cut. Also in the tertiary sector the introduction of electronic technologies completely changes the nature of the services supplied.

Consequently, the usual arguments based on concepts of output volume, unit production costs and productivity are inapplicable in this sector.

In industry, the decline in overall industrial employment may be expected to continue at a fairly high rate. The electronic industry will create jobs at world level and competitiveness will be the decisive factor for the level of national employment in this sector.

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The major unknown concerns the demand for and production of services and the social organization of this production. Employment depends on that . Here the trend in working hours will be decisive : the amount of free time appears to be one of the "overspill" mechanisms through which technical progress increases both the number of jobs and collective wealth.

The author ends with a new question : rather than stifling technical progress, are not the obstacles put in the way of its application by the existing economic and social structures one of the root causes of the crisis ? Is not the removal of these barriers simultaneously a condition for the widespread dissemination of the new technologies, a condition for recovery and a condition for a return to full employment ?

To reply to these questions it is necessary to formulate a theory of tertiary activities.

D. TAYLOR

Innovation and Employment

Youthaid, 1981.

According to the Youthaid report, hasty generalizations on the foreseeable effects of technical progress in manufacturing industries may often be misleading. In some cases, investments in labour-saving systems may bring about cost reductions that stimulate demand sufficiently to lead to an increase in the employment level. In other cases, the saving in manpower will not be offset elsewhere and the labour force will be reduced.

The report is the culmination of a two-year survey on the impacts of technical progress in industry on job prospects in the foundry, machine tool and electronic component sectors. The general results of the survey are based on replies from approximately 35 %, 42 % and 47 % respectively of the firms employing 20 or more people in each industry.

The report indicates that investment projects with a low labour intensity do not automatically reduce job prospects in an industry. It is probable that an industry's capacity to manufacture saleable products has a far more important effect on the overall level of employment than the way in which it manufactures them. This emerges from recent developments in the foundry and electronic industries. In the first case, a modest increase in productivity per worker led to a drastic fall in the level of employment; in the second, a high increase in productivity was accompanied by a rise in the level of employment.

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Most probably office automation will reduce the number of managerial, administrative and office staff needed by many firms, even though a reversal of this trend is possible if the adoption of complex manufacturing processes calls for increased administrative work.

The implications of technical progress for skilled manual labour are more difficult to identify. Although many new technologies tend to call for different skills, it is by no means certain that this will result in a general reduction in skilled manual labour. This will of course occur in some industries (certainly in the foundry industry) but the new techniques will call for new flexibility in the use of labour. This may result in a less clear-out distinction between technicians and skilled workers : in the same way as employment trends over the past two years amongst manual workers in the machine tool and foundry industries reflect the worsening economic recession, so the level of employment for high-grade technicians, researchers, technicians and draughtsmen in the electronic components industry appears to have increased as technical progress has been made.

Finally, the report briefly examines the capacity of one of the large industries in the services sector - retailing - to offer jobs to workers made redundant in the manufacturing industries. It fails to see how this sector could absorb all the workers who will probably be obliged to leave manufacturing industry. In fact, the services sector itself offers enormous potential for labour-saving innovations, which means that its own manpower requirements will fall. Even a considerably increased demand for services would not necessarily lead to a substantial increase in the level of employment in that sector.

R. BOYER and P. PETIT

Forecasting the impact of technical change on employment

Paper read at the research seminar of the Commission of the European Communities in the relations between technology, capital and labour. 3-4 September 1981.

The paper takes as its starting point the fact that there are two different approaches to the relationship between technical change and employment which have little in common. The macro-economic method leads to precise and quantified figures but comes up against a number of difficulties : theoretical problems regarding the nature of employment, empirical difficulties in defining of international competition and econometric problems in measuring technical change.

On the other hand, applied technological studies demonstrate the specific nature of foreseeable changes in the organization of production and the creation of new products. They explain the economic and social issues involved in union strategies, in company management methods or state intervention, a factor that affects the rate at which progress spreads. However, most of these studies do not succeed in establishing a clear link with the simulation of a macro-economic model tested on the past.

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The paper by BOYER and PETIT suggests integrating some of the factors determining technical progress in a macro-econometric model which, like the one tested on the medium-term development of five European industries, throws light on the respective contributions of innovation variables and variables related to the conventional instruments of economic policy. This third approach has obvious limits which are due to the difficulties in measuring innovation and the relative heterogeneity of regulating mechanisms in each of the national economies. However, it does allow a genuine linkup with applied technological studies, a necessary condition for predicting the impact of technical progress on employment.

J.L. MISSIKA, O. PASTRE, Ch. STOFFAES

Informatisation et emploi - "Menace ou mutation ?"

La Documentation Française, Informatisation et Société 11, 1981.

The work consists of three separate texts :

- "Les débats sur l'informatique et l'emploi : comparaison internationale" (Debates on computerization and employment : international comparison)
- "Les effets de l'informatisation sur le travail et l'emploi à l'horizon 1985" (Effects of computerization on work and employment up to 1985)
- "L'emploi et la revolution informationnelle". (Employment and the information revolution).

A. Debates on computerization and employment

This first paper consists of an analysis of the debates raging in Europe and in the United States. The context of the European debate is different from that of the American one : economic, technological and cultural backgrounds have changed.

In general J.L. MISSIKA, the author of the first paper, sees four paradoxes in the debate :

(a) Hardware manufacturers are two-faced : pessimistic about employment when they speak to their customers and optimistic to the general public,

(b) Even the most pessimistic studies on the effects of computerization on employment consider that a failure to introduce the new technologies would have even more harmful effects on employment (because of competitiveness),

(c) The French debate, which focuses on computing and the tertiary sector, has less to say about industry and micro-processors, as elsewhere in Europe.

(d) The essential question of methodology does not appear in the debate.

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The author then reviews the various results obtained, after outlining the methods used (retrospective micro-economic surveys and macro-economic forecasting models) and the scope of the studies (sec or, type of application, occupation).

Three types of results are then discussed : the harmful impact of computerization on employment, the favourable impact, and inability to decide. The author then outlines the positions of the two sides of industry (relativisation of the problem amongst employers, more complex and varied trade union position) and the policies adopted by the various government authorities in Europe.

After this general presentation, the author reviews the debates going on in the United States, the United Kingdom and Federal Germany.

- In the United States, the question is regarded as psychological rather than real. There, unemployment is no longer regarded as inevitable and the authorities are seen as being responsible for its level. In any case, because of the size of the computer sector in that country this technology is regarded as creating jobs even by the AFL-CIO. Computing is not the subject of an administrative section and therefore little thought has been devoted to it. Although the question of technology and society is well covered, there are few university projects on computing and employment.

- In Britain, the debate is active and widespread. Research projects are numerous and curiously enough everyone seems to agree that these technologies must be introduced despite their harmful effect on employment. There is no alternative because of the international constraint. The debate is focused on industry.

The level of public aid is high, the main aim being to make up the technological leeway that is regarded as catastrophic from the viewpoint of industrial jobs. The TUC and CBI are in favour of the development of technologies.

The studies generally consider it difficult to make a strict evaluation of the impact of microelectronics on employment. It is not possible to make a precise assessment of the beneficial and harmful effects, although the latter are the most visible. The problem in Britain is that the changeover is too slow. The SPRU is responsible for many of the pessimistic forecasts that fuel the British debate.

- In Germany, the current debate, which is more strained is a follow-up to the long-standing rationalization debate. The nuclear issue also constantly crops up alongside computing. The other aspects are more conventional, and are close to the British debate on some points (general acceptance, for example).

There is some conflict between the policy of the Minister for Technology (social democrat) and the Minister for Economic Affairs (liberal). The DGB is in favour of computerization but is calling for safeguards. The employers do not consider that there is any long-term employment problem in Germany.

There are quite a number of studies on the subject and MISSIKA gives a brief rundown of them.

The author ends by showing that in his view the main debate is between the adherents of technological determinism and supporters of a degree of neutrality in this technology.

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B. The effects of computerization on work and employment

The aim of the authors here is to inject some order into the discussion, to seek constants, to study methodologies and to introduce the reader to a large number of empirical studies. The scope is limited to automation. The study is in two parts : an empirical part dealing with various technological innovations (a series of data sheets) and a second macro-economic part which specifically tackles employment questions.

Part I is argued in terms of jobs, the quantitative result up to 1985 being as follows :

- Numerically controlled machine tools	:	4 000 jobs abolished
- Computer-aided design	:	2 to 3 000 jobs abolished
- Process automation	:	50 000 jobs abolished
- Automation of mass production	:	50 000 jobs abolished
- Word processing machines	:	82 000 jobs abolished
- Document reading and processing	:	13 000 jobs abolished (bank)
- Telecopying	:	11 000 jobs abolished

In Part II, automation is studied as having a differential influence in relation to the main developments on the French labour markets since 1965.

Four developments are singled out. If observations are not confined to users alone, it is clear that computerization creates jobs in industry and services and leads to a redistribution of jobs between these sectors. If users are analysed, it is striking to see the complexity of the job creation/job abolition mechanism and the transfers of jobs brought about by computerization.

A detailed study of these mechanisms, however, indicates that the stabilization of manpower may be assumed in the context of slower growth. Taking this hypothesis, the advantage of examining skills as well as the sectors concerned becomes clear. It is in this way that the system will adapt to the new technologies.

The study shows that the sectors and skills threatened today are the very ones whose development made it possible to mitigate unemployment in recent times.

C. Employment and the information revolution

Assuming that a post-industrial society will come about as a result of the introduction of computer technology, the author of this third paper proposes a general study of the future society, the conditions for obtaining it and the barriers in its path.

The debate is first set in an historical context in which the responses provided by theory and by economic history to the general question of technology and employment are analysed.

The author then shows what he believes to be the three main elements in the current difficulties (rise in unemployment and decline in industrial employment, emergence of an underground economy, malfunctioning of the tertiary sector and growth in organizational costs) before demonstrating how microelectronics can provide a solution. The analysis he makes is close to the cycles of Kondratiev.

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The tertiary sector is bound to show substantial development and political economy is poorly equipped to analyse and measure his development. The citizen of the post-industrial society will make use of increased productivity to work less rather than to consume more.

Thus free time will generate some new commercial activities but above all non-commercial activities which are at present beyond the reach of national accounts.

The author then shows that if our societies accept the future and equip themselves with the means and the will to face up to it, the crises will rapidly be overcome. It is necessary to rethink both work and production.

A.B. CHERNS

Some speculations on the development of microelectronics and its social consequences

International Labour Review, ILO, vol 119, No 6, 1981.

The author first develops the theory of post-materialism, which is related to that of de-industrialization, a new and more critical attitude by workers to organized work.

Any technology offers the possibility of choices. The way in which the new technologies are used will depend greatly on factors reflecting the types of industrial economies, social values and structures, and political regimes adopted in the countries under consideration. Despite that, attitudes will remain deterministic and it is rare that the full range of possible choices on the basis of a given technology is taken into account. Up to now choices have mainly been in the hands of engineers and hardware manufacturers, to whom the perfect machine is one that an imbecile could operate.

Starting from the assumption that there will be a substantial and lasting reduction in the volume of employment available, the author analyses the various possibilities open to our society : elitism, dualism, loss of the work ethic, and the consequences for organizations, unions and industry. To allow adaptations to the new situation to come about, it would be necessary among other things to separate questions of employment from the allocation of resources. The author is also concerned about the fact that existing decisionmakers concentrate solely on international competitiveness and full employment.

P. STONEMAN, N. BLATTNER, O. PASTRE

The information technologies, productivity and employment : analytical study based on national reports

OECD, Paris, October 1981.

This report examines the practical conclusions and recommendations in the reports by committees set up in the OECD member countries to study the consequences of information technology on productivity and employment. Its conclusions are qualitative rather than quantitative.

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The study analyses the past and future impact of technology on both the demand for and supply of labour. It then studies the pace at which technology is spreading and working conditions before turning to government strategies and policies.

The impact of microelectronics on a country would depend amongst other things on :

1. the technological starting point of its economy,
2. the degree of potential productivity expected of microelectronics,
3. the time scale for which the forecasting is conducted,
4. its commercial environment and the behaviour of other economies.

Up to now there is no firm evidence that the current high levels of unemployment are due to technical progress. Other factors appear to be more important. However technology does indeed have effects on job supply and demand.

The dissemination process is important for the future and the analysis tends to prove that it will be slower than might have been expected. Microelectronics can have a radical effect on industrial structures and the demand for skills and may affect some categories of worker more than others. Nevertheless the authors show that, if account is taken of the offsetting effects that can be predicted, there will be little change in overall demand.

Four points are put forward as conclusions :

1. microelectronics is becoming more and more important in all spheres of economic activity,
2. the short-term developments caused by microelectronics will have more effect on the levels of skills and the organic structure than on the manpower level,
3. a low level of application in a given country may cause its economy to become less and less competitive and that in turn may have secondary effects on employment that could be very much more serious than the effects of direct displacement,
4. microelectronics can help to improve the quality of life but, in the light of the current situation in each country, it is by no means certain that the potential benefits will actually be attained.

The economic costs will mainly be related to structural problems such as distortion between the skills available and the skills required on the labour market. It is therefore to be hoped that the policies adopted will make adjustment easier and less costly for the individuals concerned.