CIS REPORT 83

THE NEW TECHNOLOGY

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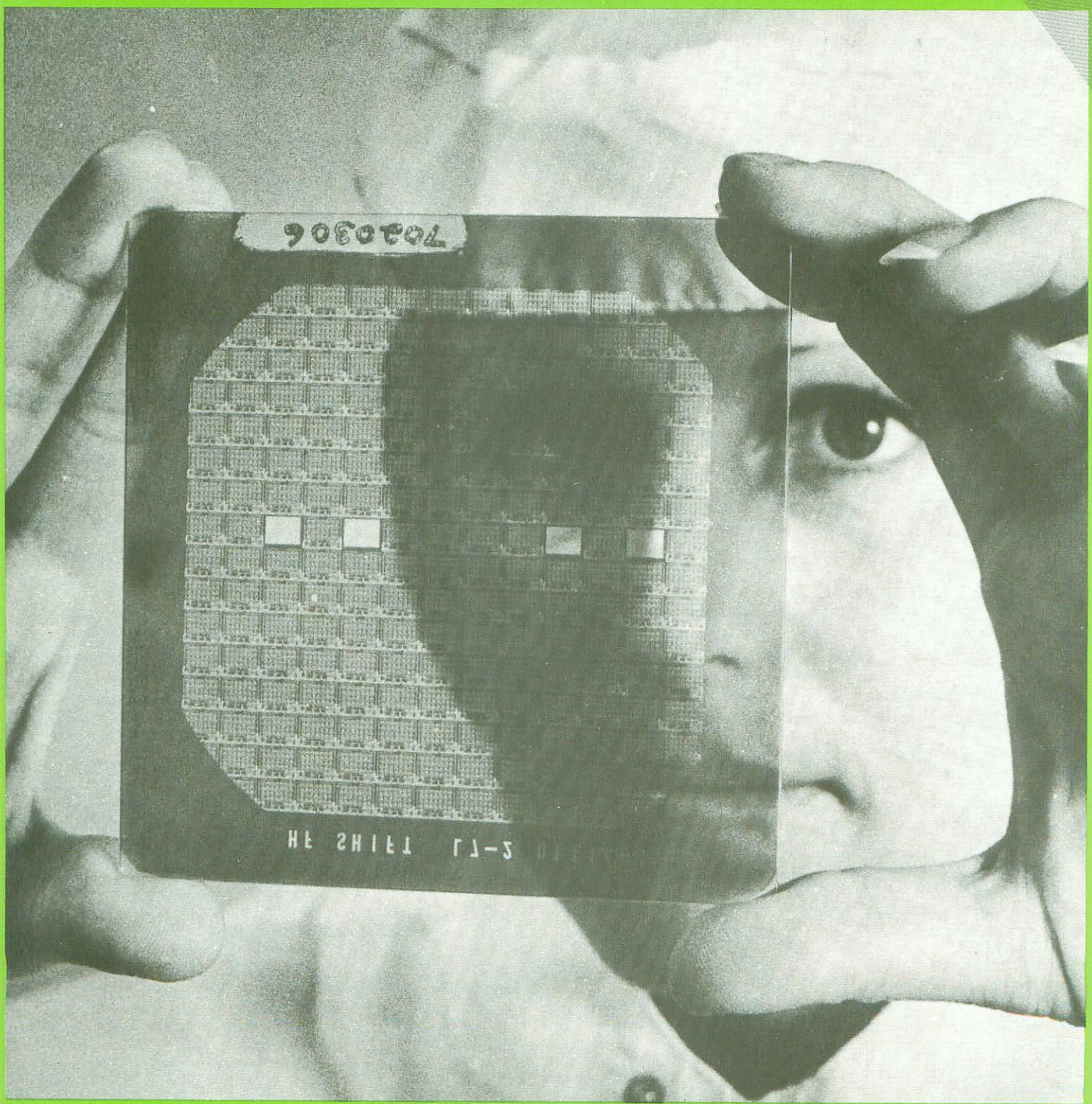

CIS REPORT

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Contents

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What is the new technology?

The silicon chip or microchip

The chip is a miniature electric circuit containing thousands of different electrical components, such as transistors and resistors, etched onto a small wafer of silicon crystal. The circuit itself is called an **integrated circuit**.

The microprocessor

One type of chip, **the microprocessor**, is the microelectronic equivalent of the 'brain' of a computer. It can carry out all the computing functions of a computer, and it is not only small, cheap and reliable, but is also extremely flexible. A standard microprocessor has thousands of different potential applications because it can be programmed in many different ways.

Other types of chips

As well as microprocessors, other sorts of chips are essential: there are memory chips to store data and programmes, and input-output chips that allow the user to communicate with the microprocessor. There are three broad groups of chips produced. a) **International standards** are mass-produced, have multi-applications and are usually made by several different companies. Typical are memory chips. The market is very high volume and very competitive, prices are low. b) **Industry standards** are chips mass produced for one particular industry, such as the car industry, or TV games. The market is medium to high volume. c) **Custom specials** are chips designed to meet the needs of a single firm or group of customers. The market is low volume, the product custom-built.

THE NEW TECHNOLOGY

"The remarkable development of machinery becomes, for most of the working population, the source not of freedom but of enslavement, not of mastery but of helplessness, and not of broadening the horizon of labour but of the confinement of the worker within a blind round of servile duties." (Braverman)

"You're a journalist. Leisure, that's what you want to get into. Because there's going to be a lot of it about." (Spokesman, Negretti and Zambra, electronics company)

There will indeed be a lot of leisure about, but the form it will take will be enforced unemployment. The new technology based on microelectronics could do away with dreary and tedious jobs, allowing all of us to work only a few hours a week. It could mean that enough goods are produced to give everyone in the world a decent standard of living. But it won't.

The people who develop and control the new technology are not interested in the quality of our lives: they are only interested in increasing profits. So instead of building a new world of freedom and leisure, new technology is bringing the fear of mass unemployment to the hearts of millions.

Why is the technological revolution happening now? The deep and prolonged recession in the world economy has coincided with the development of the technology so that it is now profitable to exploit it.

Technology does not develop in a vacuum. Microelectronics is a product of the military-industrial complex in the United States. Developed specifically for the arms trade, it is now being sold and applied by companies that achieved their economic strength through safe contracts with the US government's war departments.

The end of the long boom that followed the second world war has meant a severe squeeze on company profits, and fiercer and more ruthless competition. The result is that all companies are under pressure to rationalise, to cut costs by cutting their labour. The new technology offers an unparalleled opportunity to do just that.

New, more highly automated equipment increases the productivity of the operator, and means the same output can be produced by fewer workers. Governments and employers across the world are using microelectronic devices as a tool for massive rationalisation across the whole economy. Not an office, not a factory will remain unaffected.

The overall result will be a large increase in unemployment: unlike previous periods of rapid technological innovation, for instance when computers were first introduced on a wide scale, there is no expanding economy to cushion the blow and reabsorb workers in new growth areas.

In the UK, unemployment will rise to a further all time high – the government is almost alone in pretending that the few jobs created by the microelectronics industry will compensate for the millions that will be lost.

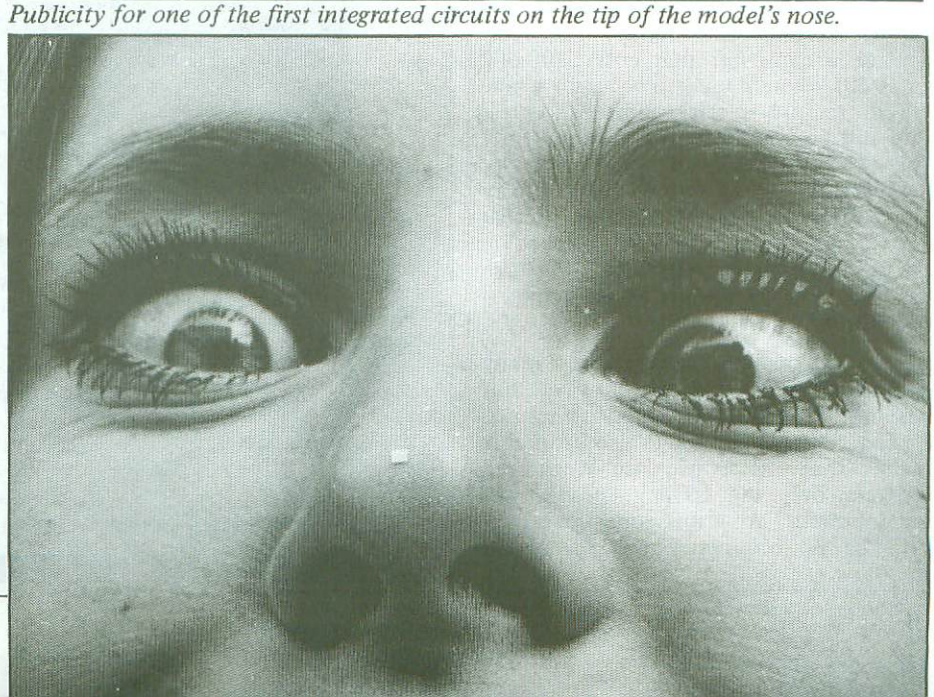
For employers the new technology offers a number of attractions. For a relatively small investment, labour costs can be cut dramatically. Those jobs that remain will be drastically altered, leaving management with even more control over the work process.

In many skilled trades, like printing or toolmaking, the workers have gained a fair degree of control over their own work. For management to change the pace or the organisation of work without the agreement of the workers involved is not possible. In many cases, though not all, introducing new technology means reorganisation of the existing work process, and this gives management the chance to alter the traditional demarcation lines that workers have built up to defend their jobs.

Once the machine tool has been replaced by a computer controlled system, once the composing room is replaced by direct input computer techniques, once the typewriter has been replaced by a word processor, control over how the work is done is squarely back in management hands. Skilled workers become little more than machine minders, and the pace of work becomes inexorably faster and more intense.

All governments in the industrialised countries are mounting a major offensive to promote the new technology. In Britain the government has embarked on a huge propaganda exercise to persuade us all that the new technology is in our best interests. It is in the interest of some, certainly, but it is going to have a serious effect on all our lives. This raises direct questions about who controls technology, and for whose benefit is it being introduced? How those questions are answered will decide the shape of our society for a long while to come.

Publicity for one of the first integrated circuits on the tip of the model's nose.



Keystone

Cover: Mask for chip manufacture.

USING THE CHIP

The microelectronic revolution means countless new products and applications are now available throughout industry.

It is thirty years since the first computers were built. Today they can handle information that would once have involved countless people in extremely complex operations. But while the threat and promise of computers may have reached the general imagination, their real achievements have been limited. Advances in semiconductor technology, though perhaps less publicised have been at least as significant. Every home now has the cheap mass produced radio and television sets which transistor developments made possible. Now further advances in this field have brought computer and transistor technology together to provide the basis for a micro-electronic revolution.

Rather than building a single transistor on its usual chip of silicon it was discovered that several could be built on the same chip . . . then hundreds . . . then thousands. Other components could be added, and still others – and all built into a single circuit. A complicated amplifier, previously assembled by wiring together many different separate transistors, resistors and capcitors, could now be etched onto a tiny piece of silicon. Add a loudspeaker, controls, an ariel and batteries and you have a radio.

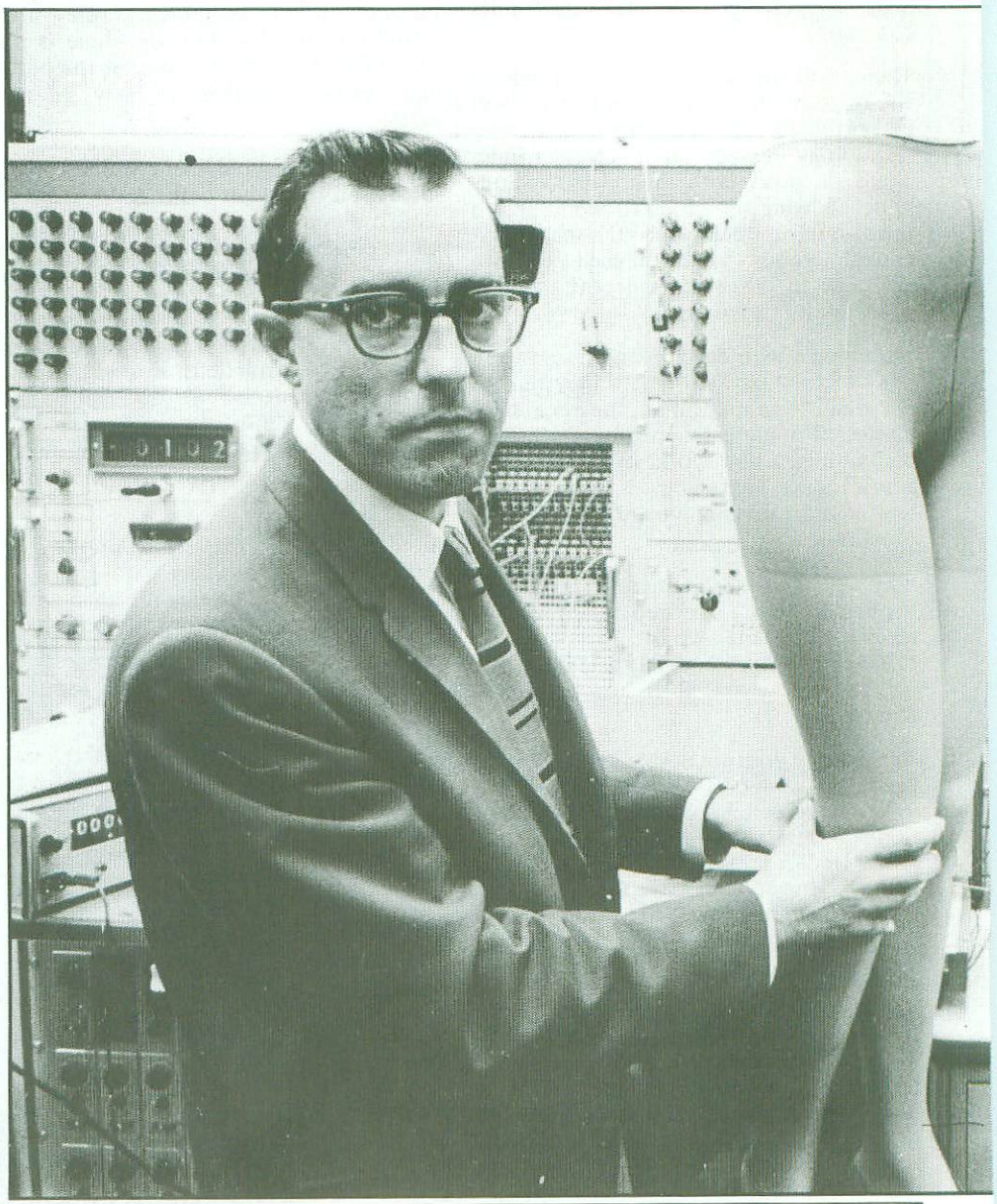
Micro processor

Just as easily the entire circuitry for a computer could be built onto a single chip of silicon less than a centimeter square. A 'microprocessor' (microcomputer) costing £20 today, can now replace a computer that cost £200,000 in 1960. Where it used to occupy a whole room, require special climate controls and still be unreliable, it is now no larger than a thumbnail, is unaffected by temperature or vibration and is many times more reliable. Reduction in cost . . . reduction in size . . . increase in performance and reliability – these are the basis of the micro-technological revolution.

Today it is possible to computerise many operations and products in ways that yesterday were in the realm of science fiction. The fact that it is also profitable means that the impact on work and workers over the coming decades will be enormous. And this time there may well be no economic boom to soften the blow.

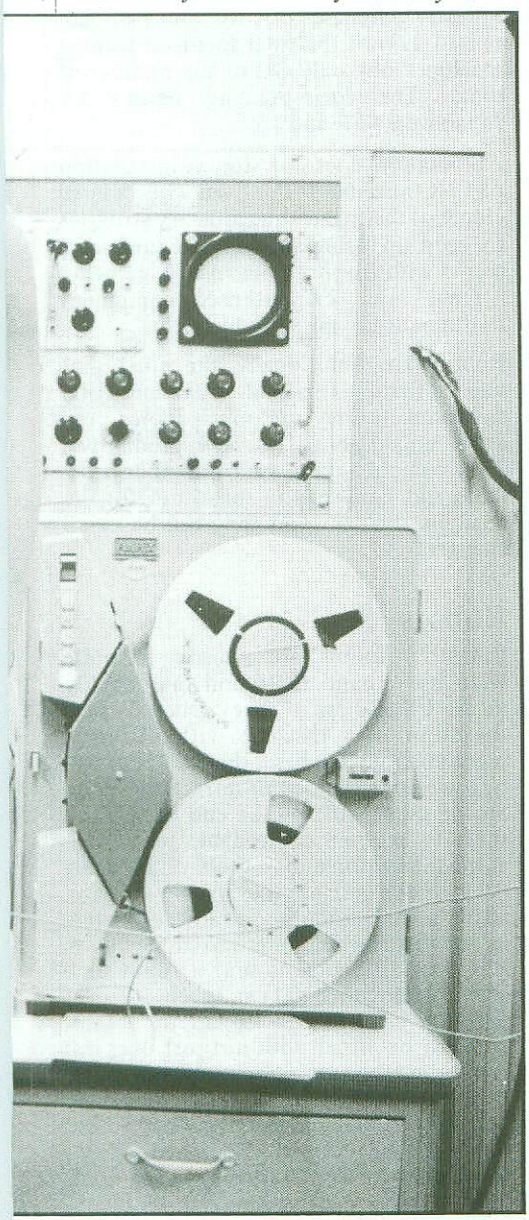
It is the dramatic reduction in the cost of computing that makes the advent of the microprocessor so significant. We have now reached the stage where the cost of a computerised machine may only be the equivalent of one person's wage for one year. Yet the machine can replace one or more people. Computers were always seen as a potential threat to employment because they could be programmed to replicate intelligent human responses. But where previously they were very expensive, that is no longer the case.

The speed with which computing costs have fallen means that it is the price of the crucial ancillary equipment, such as printers or keyboards, and 'software', the computer programme, that is holding back wider computerisation. Developments in this side of the industry have lagged far behind. But now the availability of the 'throwaway' computer is stimulating the development of much cheaper ancillary equipment and software – 'universal' chips, programmes and ancillaries will provide economies of scale



Keystone

The 'do anything' technology: electronic fault detector for hosiery.



that will lead in turn to large price reductions and technological advances.

This has already happened with accounting and word processing machines. The competition in the accounting machine field is particularly intense, with many companies offering equipment for rent at around £40 per week. That is less than the cost of a clerk, yet such computers can often handle the work of two or three clerks.

Efficiency

IBM too, despite the fact that its prices are usually higher than those of its competitors, will sell you its simplest 'stand alone' word processor for £3,700, or rent it to you for £31 a week. This word processor enables one typist to do the work of two.

Significantly, by simply cutting one job an employer can cover the total capital cost of such computerised equipment in a single year. It's the sort of equation that would appeal to even the most miserly of employers. And it can be applied to all sorts of offices, in all sorts of sectors of employment, right across the country – across the globe in fact.

Not only are these machines economic, they also hold the promise of much greater efficiency. A computerised accounting system can provide far more comprehensive figures much more quickly than the old system. It also gets the invoices out more quickly – meaning a better cash balance in the bank. It provides better stock control, so stocks can be cut – again, more cash in the bank. And so the story goes on.

So microprocessors are already moving into the office, as often as not in the guise of an 'automatic typewriter' or 'accounting machine'. That is only to be expected, because it is in office applications that the computer has already gained the largest foothold over the past thirty years. But what of the industrial environment?

Common factor

The computers' encroachment here has been much slower, limited largely to process control (chemical manufacture, oil refineries, paper making etc.) and automatic machine tool control (numerically controlled lathes, milling machines, grinders etc.). This slow penetration is due to the large investment formerly needed to make manufacturing plant controllable by computers – not only did you have to buy the computer, you also needed to invest heavily in process plant or machine tools that could be controlled by it. The data and mechanisms controlled by the computer in industry are far removed from the simpler office applications. What's more, the diversity

of manufacturing systems and processes in the past meant that the potential sales for any one computerised production system were small. But the cheap computer, as represented by the microprocessor, will change all that.

There is a common factor running right across all industrial manufacturing – and that is human control. The microprocessor offers the possibility of copying intelligent human responses and incorporating them into machinery at minimal cost.

It's not a question of building robots that copy the human form. Rather, it's a matter of developing a new generation of equipment that can respond intelligently in a way that is compatible with today's manufacturing methods. Countless workers are employed doing repetitive tasks of one sort or another the world over. There is a huge market in replacing even a small number of these. The equipment manufacturers will be only too happy to oblige. And when prices drop to the levels that we can already see in the word processing and accounting machine markets at present, the industry's management will be only too happy to buy.

At the moment we are some way from that point, but prices are already dropping rapidly in real terms. Working from the top down, take a system for computer aided design. This allows a draughtsman to design components or systems at a much faster rate, using the computer as an electronic drawing board. A computer aided design system that cost £1,500,000 in 1969 would now cost less than £70,000. That is a very rapid drop in its own terms, but look at it in terms of the average annual earnings of a male non-manual worker. In 1969 it took about 900 man-years to pay for the computer. In 1978 it takes just over 13 – and if you take the full cost of employing a designer as the criterion it probably comes down closer to five years. And the price is still dropping.

Not only does computer aided design enable the designer to be much more productive, it can also turn the designs out in a form compatible with computer controlled machine tools. In theory there is no reason why the output from the design computer should not be fed directly into that controlling the machine tool. The designer, in effect, can take the product through to fabrication, and the manual crafts, the lathe or milling machine operator, are squeezed out. Only the machine minder and maintenance staff remain, watching over rows of machines.

The beauty of microprocessor controlled equipment, so far as management is concerned, is that you don't have to go that far all at once. Each machine can be justified, in terms of increased productivity, on its own. Just as the cost of computerised design has been dropping, so has the real cost of computer numerical controlled (CNC) machine tools.

Machine Tools

As *The Engineer* (22.2.79) put it, 'the cost of the computing element in CNC machine tools is becoming negligible . . . Fifteen years ago the control system was anything up to 40% of the total installed price of a machine tool. Today it is less than 10%', and it is still dropping while the price of the hardware rises. You can already buy a CNC lathe, for instance, for £25,000 but 'productivity is high and invariably one CNC machine will replace three turret or capstan lathes' *(ibid)*, and much higher productivity jumps have been recorded. At Davis of Derby, for instance, a single CNC milling machine took over the work of eight different machine tools . . . which left their operators where?

CNC machine tools are the first step in radically uprating productivity in the engineering industry. This is because so much of the industry's output – currently 70% – is in batch production rather than mass production. And about half of those batches are of 50 items or less. The estimated cost of producing a small batch is between 10 and 100 times as much as mass producing it.

This high cost is largely due to low capital investment in equipment for small batch production in the past. As a result, inefficient general purpose machines are used, setting up times are long and machining rates are low. So the machines are used at well below their capacity – often only one-tenth or one-fifth of it in fact, and the work in progress spends a lot of time piled up on the shop-floor waiting to get on the machine.

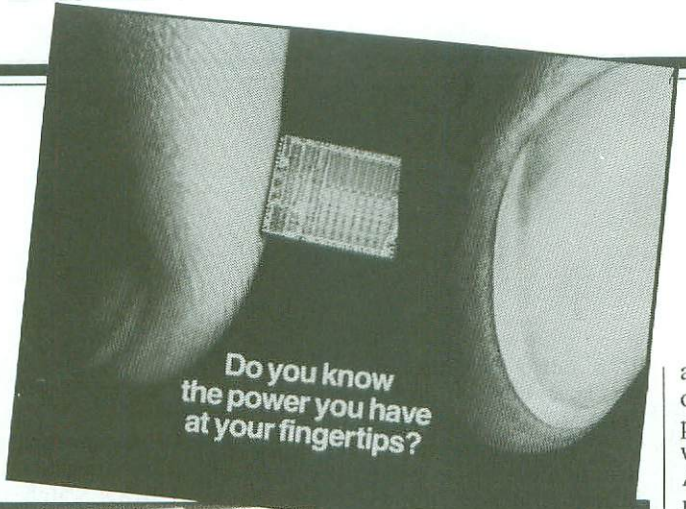
CNC machine tools can be set up in a few minutes. They run faster, and at a predetermined rate: predictability that lends itself to tight work scheduling. So even with small batches, the machines can be run much closer to capacity, and the work can be programmed through the shop on a much tighter schedule. That means slashed machining and stock costs, more uniform quality, faster delivery, higher throughput, and many less workers. The process has hardly begun in the UK though: in 1977 UK industry purchases of CNC lathes amounted to 22% of the total spent on turning machines but only 3% of the number of units. The corresponding figures for Japan were 46% and 16%.

Automation does not stop at installation of CNC machine tools. Even while a large chunk of the engineering industry struggles to keep up, using antiquated equipment, plants with advanced machinery are being offered more computerised equipment to dramatically raise productivity.

Robots are traditionally the stuff that science fiction is made of. In the industrial environment they are much more mundane, unappealing . . . and productive. They can already be used as an indestructable and hardwearing substitute for the machine minder. And they can be much cheaper.

Robots

Industrial robots are already in quite wide use around the world, particularly in the US and Japan. They generally take the form of a machine with one arm, pivoted about the base, that can be raised or lowered, extended or retracted over an arc of over 180°. At the end of the arm there is another controllable joint with a mounting for either tools or handling devices. It's roughly like having a person sit on a chair, and use one arm to operate and feed a machine or group of machines. The first difference is that a robot such as the Unimate 2000 can reach out over 3ft., carrying a load of up to 150lbs, and can be fitted with not just one, but two 'hands' – i.e. gripping devices. The second difference is that the robot can not only be taught exactly what to do, but will then repeat those instructions very quickly and accurately for long, continuous periods of time.



Microcomputer and (below) its 1948 predecessor at Bell Telephone.

Instructing a robot is simple and quick. A teach control is plugged into the machine, and it is driven manually at a slow pace through the routine that has to be followed. The movements are recorded in the computer memory and can then be repeated continuously at full speed. Again the directness of control is reinforced – it will obviously be the work study controller who decides what routine the machine should follow, and the logical next step is for him or her to actually instruct the robot directly.

Spraying and welding

The robot and machines, once set up, can keep working as long as the tools last, supplies are provided and products removed. There's no need for them to stop for tea breaks, lunch breaks, the toilet or sleep. They can be shifted onto a new product in a matter of minutes rather than hours. And very expensive machinery, costed in hundreds of thousands of pounds, can now be run 14 or 24 hours a day, instead of 7, with a cut in labour costs. The cost of a basic robot? About £20,000 for the Unimate – or just three times the annual cost of a skilled machinist. And the robot is flexible. It can be easily used for different work in future years.

That's cheap. As Unimation point out, 'it appears that more and more manufacturers are understanding that there are two ways to boost production. One is to make large investments in new machine tools and heavier automation. The other is to make little or no investment at all in new tools or automation, and to spend a modest sum on Unimate robots. The robots are put to work serving existing production tools, and because Unimate robots can serve machines at a rate and consistency no human worker can match, machine tools run closer to their full potential. Result: not only higher production, but faster payout of existing capital investments at the price of a very modest new capital investment' (Robots in Industry Summer 1978).

This is the very essence of rationalisation: spend the minimum amount of money on equipment that is as flexible as possible, displace the maximum number of workers and boost profits immediately. The same arguments can be applied to most parts of industry, particularly in Britain, and particularly where large numbers of workers are employed on repetitive tasks. And one important area of industry remains, so far, almost virgin territory so far as automation is concerned – assembly.

'Assembly is one of the most important areas in manufacture for many reasons, but paradoxically, it is one which has received the least attention from the automation point of view... Technically, it is the most primitive of the manufacturing processes as the evidence of comparative capital expenditure shows . . . Organisationally, it is the area in which the process remains wholly man-orientated and where costs of production and man management are the most difficult to control.' (*The Engineer* 22.2.79)

But the difficulties involved in the automation of assembly work can now be overcome by a new generation of computer equipment. Flexibility combined with falling price enables it to be introduced without prohibitive capital cost. And given the manufacturers' desire to control labour costs in this area, attempts to introduce the new computerised equipment are inevitable.

Automation of many jobs is possible, but it is unlikely to take the form of robots copying the human form. What will emerge is a series of cheap, standardised machines, probably comparatively small ones. They will be built round the microprocessor, using standardised components with various power sources such as hydraulics and compressed air as well as electricity. They will be flexible and easily programmable and be able to respond to faults or breakdowns. But above all, though they won't look like robots they will replace jobs.

Computers, whether large or small, are already having an effect on employment in many industries and services: in design, engineering, process control, printing, accounts and management information, telecommunications and so on. Even now, a local authority in the US uses one to assess the 'productivity' of its social workers. Soon patients will be expected to 'talk' to a diagnostic computer before seeing the docter, enabling them to deal with more patients at a faster rate. It's

already happening.

There is another side to the coin in terms of employment and this is the fact that microprocessors and the emergence of sophisticated miniature electronics will change many products, as well as production and service methods. And that too will cut jobs in many sectors.

The telecommunications industry has already seen this happen. In 1967 there were 99,400 people employed in the 'telegraph and telephone apparatus' industry. By 1976 this had fallen to 73,600, and it is now around 65,000. The prospect is that, even if the industry manages to maintain the same level of output it achieved in 1976, employment could drop to 10,000 or less in the 1990s. Why? Largely as a result of rapidly changing technology.

Banks of Chips

Back in 1967, electromechanical telephone exchanges were being installed. That was the technology of the day – it enabled exchanges to be automated, decimating the number of telephonists in employment. Since then, new types of telephone equipment have been developed. First came the TXE-2 and the TXE-4, a semi-electronic system which is being installed now. The latest development is System X, an entirely electronic, digital, computer controlled system, due for introduction in the 1980s and based entirely on micro-electronics and microprocessors. System X is being developed in the UK by GEC and Plessey, while similar electronic systems are being developed by AT&T (US), Thorn Ericsson and others.

The workforces of these companies will be the first to feel the heavy impact of technological change. In the UK the workforce required to build the TXE-4 is less than half that required to build the preceding Strowger electro mechanical systems: hence the shrinkage in the industry so far. But the fully electronic system requires only one-tenth the number of workers needed for the TXE-4: so we can expect a further decimation of the telecommunications manufacturing workforce over the next ten years if the employers have their way.

It is not a declining industry. There is no lack of profitability, nor is there competition from imports from low cost labour countries. The possibility of job cuts arises principally from the introduction of the new technology. The new telephone exchanges use banks of chips: each containing the equivalent of around half a million components, each of which would have required manual connection under the earlier system. Each chip replaces tens of thousands of mechanical relays, previously requiring a great deal of labour in the manufacturing process.

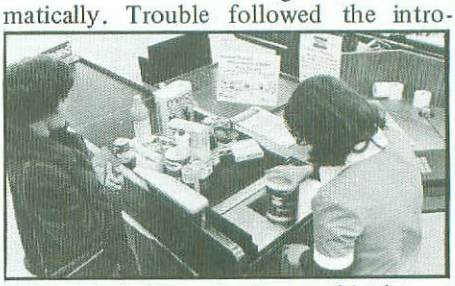
Plessey, GEC and ITT/STC, the three main companies in the industry in the UK, have over the last decade cut tens of thousands of jobs in this sector. They are all still making healthy profits – only those who suffered the unemployment that resulted know the true costs.

No less startling has been the change in cash registers. National Cash Registers (NCR), the world's leading manufacturer, has been able to discard virtually all the mechanical parts from its cash registers and replace them with 'micro-circuits not much bigger than the head of a pin. These replace mechanisms that require hundreds of individually mechanised parts and scores of space-consuming machine tools and manufacturing processes to produce them' (1975 Annual Report). In five years this development led to the reduction of NCR's manufacturing workforce by 50%, from 37,000 to 18,000.

Throwaway

This same effect is, or will be, felt in many other industries. Instrument manufacturers are rapidly going over to microelectronic components – which means that the jobs of those engaged in making dials, gauges etc., whether for use in factories, generating and process plants or vehicles, will be under attack. The massed banks of controls and dials in the control centre of a power station or process plant, for instance, can be replaced by a video display unit and microprocessor that selects appropriate information requiring attention and flashes it on the screen. The instruments on a car dashboard can be similarly replaced by liquid crystal display, so that practically all the present array of complex instruments and wiring is replaced by a single chip and a display unit.

Computerised cash registers will soon be as familiar as pocket calculators and digital watches. Some cash registers now being used in supermarkets record not only the price of the goods sold, but also register this automatically with stock records so that reordering is done automatically. Trouble followed the introduction of these in Denmark's largest supermarket chain when workers discovered the machine would check on how fast the operator worked and how many mistakes were made. They refused to use them until this function was removed.



Keystone

Newer systems remove the need for cashiers to clock up prices of items, instead an optical pen is rubbed across the tag and a laser reads the price. Soon checkouts will be linked to computers controlling the movement of goods from warehouse to store, as well as debiting the account of the shopper and crediting it to that of the store.

'Countless new products are now economically feasible because of the advancing technology and the falling price of integrated circuits' says J. Fred Bucy, vice president of Texas Instruments. 'The only real barriers to many new developments are our own parochial imaginations' (*Business Week* Survey 1977).

Microelectronic applications have advanced rapidly. There is already a huge market for TV games and video recorders. The new micro components are being incorporated into motor vehicles, but electronic ignition is a first and very conservative step. Domestic appliances too are being affected. Microcomputers are being built into cookers and washing machines. Applications will increase as the price of the technology continues to fall. It is already possible to buy a microcomputer for one dollar. The age of the throwaway computer has arrived.

Applying the technology

Most large companies are already applying the new technology, or making plans to do so. What they're not doing is talking about it publicly. As a sales manager from Negretti and Zambra pointed out, 'employers are very sensitive about this sort of thing, and we can't tell you because once we've set them up with a system, then it's their property as far as we're concerned'. As the *Engineer* (22.2.79) put it, 'the one question Renault executives steadfastly refuse to answer is how many men the robots replace' and again, referring to two systems supplied by the National Engineering Laboratory, 'neither company concerned wishes to be named'.

Companies like British Leyland, Lucas, GKN, GEC and Ford UK, which between them employ over 600,000 people, are already experimenting with advanced engineering or assembly equipment in the UK, but they won't admit their plans because of the fears of job losses. British Leyland has admitted that Unimate welding machines will be used on the new 'Super-Mini' assembly lines at Longbridge, and this is just the beginning. Similar equipment can be used for spraying shoes, as at C & J Clark Ltd, or loading and unloading computer controlled lathes such as those of the 600 Group's Hydro subsidiary.

At the moment many companies, particularly smaller ones, are reluctant to commit themselves to advanced technology. Partly it's fear of purchasing unsuitable or unmanageable equipment, and also the effect of rapidly falling prices that make it worthwhile hanging on to get a better price for better equipment later. But the equipment suppliers are already responding to the modest perspectives of the companies. They 'have taken a step back from the very advanced systems and are looking at ways of bringing the machine tool users step by step into more advanced systems' *(ibid)* . . . and step by step cutting jobs.

The Microprocessor Comes to Ford

'Confidential' internal documents of the Ford Motor Co. (UK), relating to the introduction of the new technology reveal both the extent of new technology already introduced and the potential. In most cases the schemes are already being introduced and although not directly affecting shop floor work give some early implications for the workforce of a large UK manufacturer.

'Future Directions of Computer Technology'

'Microprocessors will play a major supporting role in new manufacturing and assembly facilities in the future. We can only guess at the impact they will make in the long term. **At one end of the scale they could be used to automate many of our assembly and testing requirements. At the other end they will be mainly used as a substitute for existing mechanical control devices. Certainly we cannot fail to take advantage of them if we are to remain competitive.**'

Fords Information and Data Control System

The 'office system', as it is called, is designed to increase the efficiency of handling information inside the Ford empire. It will be used to control and plan both production and the financial aspects of the business. It will be run on low cost computers with information being fed into the system at any location, from the shop floor as well as head office. Although the company does not say so, **it will simplify the move to automation of assembly work and the introduction of computer controlled machinery in the press and paint shops and the engine and component plants.**

The bulk of the 'mechanisation' on the shop floor contained in these plans relates to the control of those working at Ford and the movement of stock inside the plants.

'Mechanised Timekeeping'

'Timekeeping – In Britain this whole process is entirely manual. A mechanised system is being devised for the new plant in Bridgend. Hourly paid employees will carry a plastic card which will double as an identity card and a clock card. There will be no card racks but the clock terminals will only accept cards from employees assigned to them. Identity numbers and clock times will be recorded on a magnetic tape for direct entry to the computer.'

'Foremen's timesheets will be pre-printed with employees names and basic work pattern. Hours worked and account numbers will be marked on the pre-printed forms which will be directly read by special equipment and then input to the computer . . .'

'Costs – £100,000. Benefits – two heads will be avoided in the timekeeping function, clock cards will not be produced or distributed. Profit improvement will be £40,000.'

Ford intend to extend this system to the rest of their plants in 1980 at a cost of £919,000 with an annual profit improvement of £320,000.

Stock control

Mechanisation of stock movement and control represents the first step on the road to extensive automation of car production. Computerised stock control has already been initiated in the assembly plants and is now being extended throughout the company's plants. Computerisation 'will consolidate demand from all sources and provide a basis for establishing the detail production plant' . . . 'enable major rescheduling actions to be undertaken if significant disruption is caused to the planned schedule'.

The benefits to the company are sometimes specifically stated. Overcoming the tendency of the production manager to order 'too much material to protect production' and 'rescheduling if disruption is caused to the planned schedule' for example will save around $790,000 annually.

Elsewhere the benefits are not so precisely specified or are couched in innuendo. The overall message though is clear – a reduction in labour costs. Here are a few examples from the section on the stock control 'system': 'reduction of overtime . . . reduction of effort . . . reduction in clerical effort . . . head counting saving . . . optimum utilization of manufacturing resources'. (Source: Ford (UK)'s 'Future Directions of Computer Technology')

AUTOMATING THE OFFICE

World processors and other automated office equipment are having a devastating effect on job opportunities, particularly for women.

The most widespread application of new technology, and the area where the largest number of jobs is immediately at risk, is within the office. Factory workers are already familiar with the drive for greater productivity: the breaking down of each job into its simplest component parts; the meticulous measurement of each worker's performance; the removal of all individual initiative; the pacing of work by machine rather than by the operator; the necessity to spend every second of the day at the machine; the constant drive to speed-up; and the perpetual attempt to cut jobs. **Now these techniques are within the reach of the office manager as well as the plant manager. The effect on job opportunity, particularly for women, will be drastic.**

There are now more women in paid employment than ever before. In the UK there are 9.1 million women workers compared to 13.1 million men – they form 41% of the workforce. Although this growth is most marked in the UK, it is common to all industrialised western nations. Not only are more families dependant on two wages, but more and more women have gained, and expect to retain, a degree of financial independence.

The increase in the number of employed women has not been matched by a decline in the traditional distinctions between men's and women's work. Women are still concentrated in certain industries and in particular, predominantly low paid, occupations.

Over 70% of women are employed in the service industries, as compared to only 40% of men. **No less than 40%, two out of five, of all women workers are in clerical occupations: clerks, typists, secretaries, office machine operators, telephonists and similar jobs. There are three million women office workers. The importance of clerical and office work to the female workforce cannot be overstated.**

Why it's happening now

The number of office workers has been growing steadily – office wage costs are increasingly eating into company profits. In the US, 'information workers' accounted for 53% of all wages in 1967. Some estimates put it at 65% today. In the UK too over half the working population earn their living by handling information, according to a Post Office spokesman.

The cost of running offices, mainly wages, accounts for half of the total operating costs of all US corporations. In government and service industries such as banks and insurance firms, the office wage bill is a full three-quarters of total costs. In the UK, wages now account for nearly 80% of all office costs.

While costs have doubled over the last decade, office productivity has remained almost stagnant. US estimates reckon that it has increased by only 4% while, in the same ten years, industrial productivity nearly doubled. This is not surprising given that whereas there is some $25,000 of investment behind every production worker, there is only $2,000 worth for each office worker.

As office employment and wage costs have soared, the price of office automation equipment has been falling by about 10% per year. Rationalisation of the office has become a real and economic possibility.

The automated office

'We aimed to design a system for the next decade. Our yardstick was, if a piece of paper remains, let's ask ourselves why, and see if we can get rid of it, and if a punched card remains, let's ask ourselves the same question. I think we have been remarkably successful.' (Services Manager, Friends Provident Life Office)

'It would be easy to ridicule some of the more extravagant predictions about what one manager called the "all-singing, all-dancing office of the future". But most of the major suppliers of equipment take it extremely seriously.' (*Financial Times* 23.10.78)

Silicon technology, initially developed in the field of computers, has not only spread into the areas of office equipment and telecommunications, it has converged the three areas. The combination, known as 'information technology', opens the door for the automated office from which paper, as the medium for handling information, has practically disappeared. Office work is largely concerned with acquiring, storing, transforming, presenting and sending information. While clerical workers transform, store and transmit information, executive level office workers assimilate existing information, manipulate it and generate new information.

Information originates as speech, typed or handwritten text and accounts, diagrams or photographs. The new technology can deal with all these forms: word processors deal with text; data processors with accounts; electronic telephone systems with speech; and facsimile transmitters with images. The computer services all of them.

The move towards office automation is being spearheaded by the word processing and accounting machines. There are already over 100,000 word processors in use in Europe – 40% in West Germany, 16% in the UK and 13% in France – and over 400,000 in the US. These figures are expected to double in the next two years. In terms of value, the European market for accounting machines is even larger than that for word processors. Mackintosh Consultants estimate that, despite falling real prices, it will rise from $256 million in 1976 to $391 million in 1981.

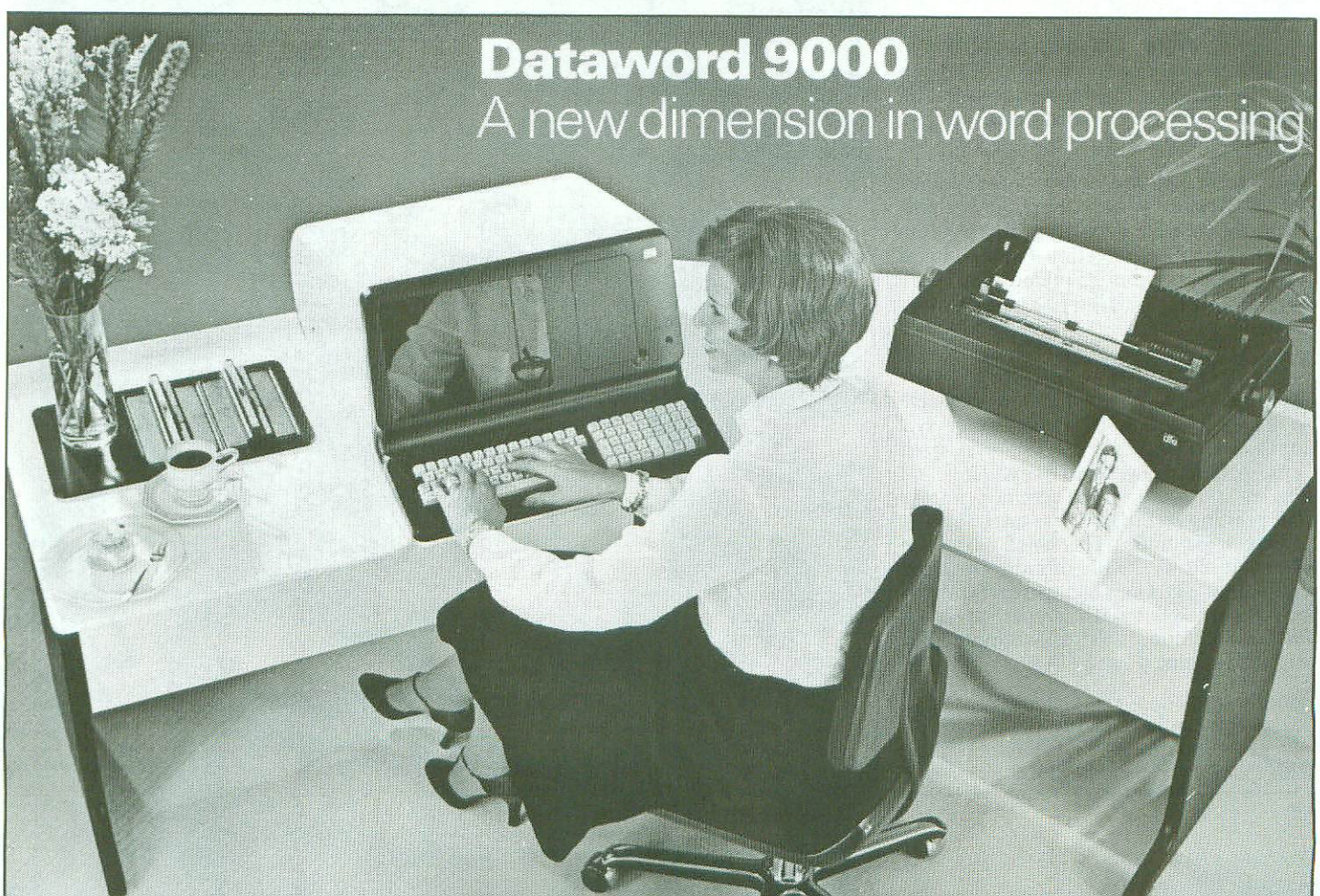
Both the word processor and the accounting machine are now based on very similar technology, utilising the microcomputer or a larger, centralised computer. Although we will deal here mainly with word processors, as a new phenomenon dramatically affecting office employment, probably just as many jobs will be lost in the immediate future to increasingly available electronic calculating techniques.

As a recent advertisement for Philips Data Systems puts it, 'for £44 a week, Philips' new computers will take over all the routines and give you more time to get down to business. That's less than the cost of a clerk, yet Philips' computers handle the work of three . . . All your payroll, ledgers, invoicing, stock records and VAT take minutes instead of hours – with accuracy guaranteed. At £44 a week, Philips' computers pay for themselves over and over again'.

Word processing

The word processor enables a typist to produce the work of two or three, while reducing the skill she needs. The typist types into the machine's memory, and what she types appears on a visual display unit (like a TV screen). Only when the

Keystone



display shows that the memory holds the text in the correct form will she instruct the machine to print it out. This is done by a separate printer which is many times faster than the speediest typist.

There is no need for time consuming erasure when correcting errors on the word processor. Until now, the number of errors and the need to go back, white them out and retype has been the limiting factor on a typist's speed. Now errors can be retyped at the touch of a key, and less skilled typists can work at the same speed as more accurate ones (this advantage of word processors is much vaunted by advertisers).

The word processor automatically centres, indents and justifies margins as instructed. The skill required to produce a neat well laid out document is eliminated. It will produce any number of error free copies of an original text once it is in the memory. The operator can automatically interrupt standard material to insert text specific to each letter, such as a name and address and account number.

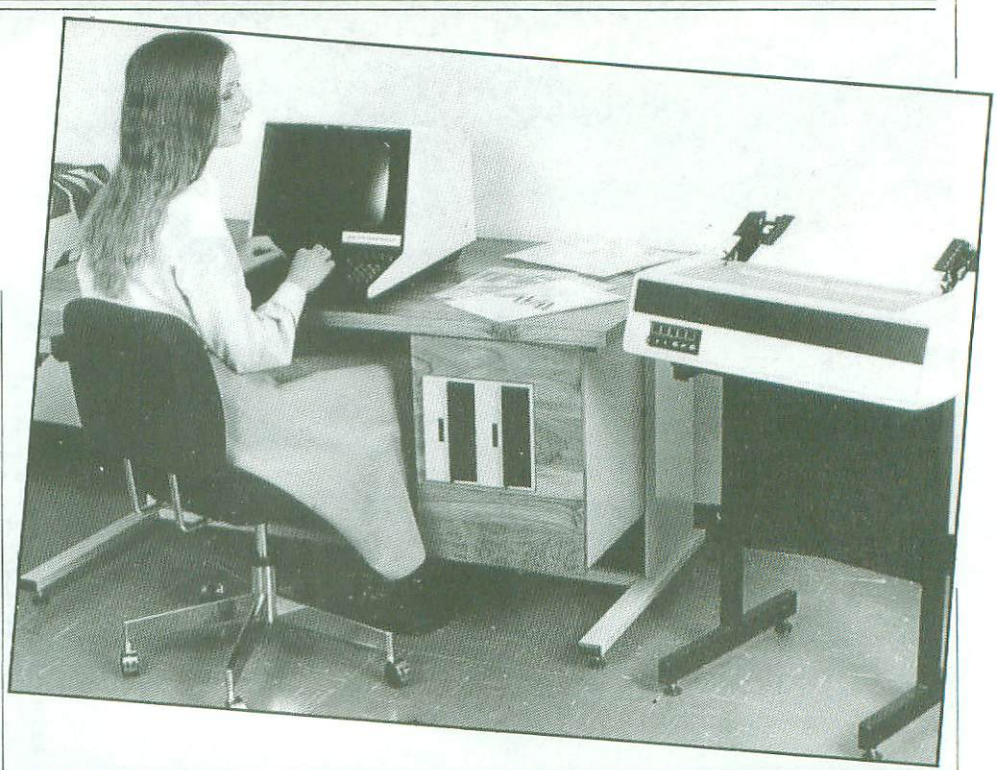
Complex editing, including re-ordering of paragraphs, inserts and revision of lay-out is possible. This eliminates the need for retyping the entire text as documents are edited prior to the final draft.

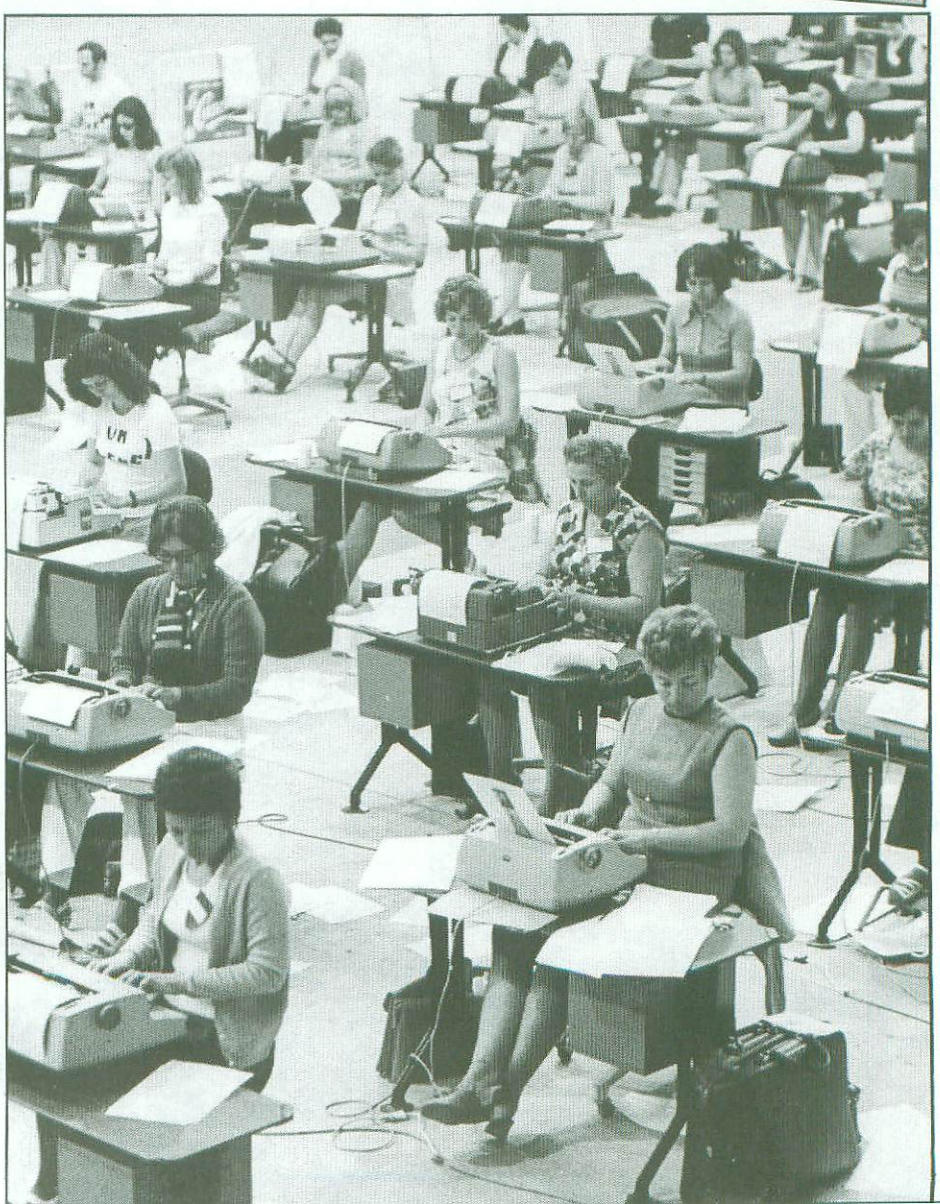
Automatic sorting enables input typed into the memory to be sorted into alphabetic order after being typed in random order. Qualified selection enables items to be selected from the memory by specified criteria, e.g. all subscribers in London.

Electronic mail

Word processing systems are available in different forms. In a stand-alone system, all the elements are in a desk-sized unit. Alternatively several keyboards and display units may share common storage and printing facilities. These are known as shared logic units. The chief advantage is that it allows the use of more advanced equipment e.g. a new Siemens laser printer being marketed by ICL 'types' at 2,000 lines per minute. It also allows more logic and text editing power.

Thirdly, separate stand-alone or shared logic units can be linked to the company's mainframe computer, and to one another. This link-up can be either local or remote.





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If it is remote, then it will use a private automatic branch exchange (PABX) and telecommunications links. The advantage of mainframe systems is that they allow each word processor access to the power and memory store of the large computer.

Once the word processor is connected to the data processing power of a large computer, and, via the PABX to the telecommunications networks of the world, then the ingredients of total automation of office work are there.

Letters need no longer be posted: they can be transmitted from one work station to another – or indeed to many hundreds of others at once – while a copy is safely stored in the originating processor's memory, to be recalled at the touch of a key.

The Post Office estimates that, for an organisation sending 2,000 pages of A4 a month an average of 100km, by 1986 the cost of sending each page will be 11p by first class post; 2.5p by word processor on a store and forward overnight basis; 5.4p by facsimile transmission; and 37p by telex.

But these savings are small compared to those to be made in labour costs in the preparation of the documents. In 1976, in the UK, one A4 page cost an estimated £2.75 to prepare and 8½p to transmit. Productivity in text preparation will be dramatically raised by the word processor.

The effects so far

There are already over 9,000 word processors installed in the UK, and the market is expected to double by 1981. Word processing is with us now. What are the effects of its introduction?

The main effect is increased productivity. And that means fewer jobs. Word processor suppliers claim that the average typist or secretary spends only 30 to 35% of her time at the typewriter, and a high proportion of this time is spent retyping corrected drafts, standard letters and forms. Many processor suppliers claim cost savings of 50-100%. Logica, distributor of the UNICOM system, claims productivity increases of 150-400%, or one typist doing the work of 2½ to 5 typists on conventional equipment.

The word processor and the women who will lose out.

One large employer estimated that a typist spent her day like this:

	Conventional typewriter	Stand alone word processor
Typing text	27%	55%
Telex	6%	6%
Retyping	17%	5%
Correcting errors	11%	5%
Paper handling	10%	–
Waiting time	5%	5%
Rest allowance	24%	24%

The time spent by the typist on typing doubles with the shift to word processing. In this case the employer expected that the installation of 4 word processing units would reduce the central typing pool from 14 typists and 1 supervisor to 11 typists and one supervisor, while simultaneously increasing the workload, and the workspeed.

Bradford Council reduced its staff in one section from 44 to 22 with the introduction of 9 word processors, resulting in an increased productivity of 19% and an estimated annual saving of £59,000. The authority now wishes to introduce word processing across the whole education department, with a possible loss of 200 jobs.

The British Standards Institution created a centralised specialist word processing department when it installed 10 IBM word processors. The Institution handles a large quantity of long technical documents that go through several drafting and correction stages. The number of secretaries and typists employed fell by a third.

The Provident Financial Group installed three IBM memory typewriters into a central typing pool. They reduced their full time typing staff from 27 to 17, their part time staff from 13 to 3, and increased the workload. The jobs were cut through natural wastage. Productivity is being monitored.

The Halifax Building Society progressed from automatic typewriters which they had used for 10 years to a system of 16 IBM word processors. The workforce has not been reduced – but the workload has almost trebled. The typists are at the machines all day apart from two 15 minute breaks and a lunch break.

The National Coal Board has installed word processors on a pilot basis at its Staffordshire House building, reducing staff through natural wastage from 20 to 14. Its Mining and Research establishment in Bretby is considering installation, expecting a staff cut of 35 to 26.

The Central Electricity Generating Board has cut its 'girls' at the typing centre in Bristol from over 50 to 26, and the supervisor adds the advantage: "a less experienced typist is able to produce the same quality of work as a really skilled girl and almost as quickly".

There are many other examples showing the same characteristics. The pattern so far has been that a large number of jobs *have* been lost, but only small numbers at any one time. Because of the high turnover of labour in offices, managements have usually been able to reduce their staffs by 'natural wastage', i.e. not replacing workers who leave of their own accord are invalided out, or reach retirement age; rather than by forcing redundancy. What this means is that job opportunities are lost. In local government, the pattern has been one of 'redeployment' to another section – again this means an overall loss in job prospects. Companies whose business has been expanding have not reduced their staffing levels – but nor have they expanded them while output has risen many times over.

Health risks

The introduction of word processors has had other results besides job loss. **For those who operate them, the intensity of work is increased, and those aspects of office work that make it less unpleasant than factory work are systematically removed.** Monotype claims in its advertisements: 'Costly and energy-wasting procedures are abolished: the walking, waiting, filing, correcting, updating and supervision go, and are replaced by a system that does what you want it to do'.

What this looks like in practice is described in a report on the experience in Bradford's word processor installation: **'the machines are in constant operation**

and are programmed by the rate material comes in. The workers have one ten minute break in the morning and afternoon, and otherwise have no contact with other workers during office time. All new work comes in through a special anti-static glass box, and no non-section workers enter the room.'

A word processor operator in a Leeds manufacturing company describes her work: "We work a 7½ hour day with half an hour for lunch. We have a ten minute break in the morning and another ten minutes in the afternoon, but the afternoon isn't official. We've been on flexitime for two years but now it looks as if they're trying to get rid of it. **All the word processing machines are switched on and off at the same time, and they want us to make a record of all the work we do, so they can monitor how many orders each person is dealing with"** (Leeds TUCRIC bulletin No.4)

There is growing concern at the potential health hazards involved in sitting in front of a Visual Display Unit (VDU) screen all day. Eyestrain which produces headaches, fatigue, focusing inabilities, nausea, and even psychological reactions can result from long hours reading data on the VDU's cathode ray tube. Such reactions are particularly likely if the operator already has visual defects. A third of the employee population is estimated to have uncorrected visual defects. Other variable factors increasing the likelihood of adverse reactions include age, general tiredness, anxiety, and the use of certain drugs such as the contraceptive pill. Lack of frequent rest periods will increase the effect. (*Health Hazards of Visual Display Units*, Rachel Birnbaum, Source: Information and Advisory Service, London School of Hygiene and Tropical Medicine, March 1978)

An additional feature of word processing is the change it brings about in office hours. Pressure to get maximum possible use of the new machinery moves managements to try and move away from flexitime, and, if possible, even introduce shift working. The trend is likely to spread, particularly with the use of telephone lines to transmit text and data, which is cheaper in the evenings. Logica, the office systems company, has had an additional 6pm to 10pm shift for well over a year.

Another benefit to management is the ability to monitor its office staff more closely than ever before. Built-in supervision is a major selling point. 'A built in reporting system helps you monitor your work flow. It automatically gives the author's and typist's names, the document number, the date and time of origin and last revision, the required editing time, and the length of the document', claims manufacturer WANG.

Those who favour the use of new technology make much of the notion that it relieves people from boring, repetitive jobs. In the case of word processors the opposite is true. From being a member of a social office, responsible for all stages of document preparation bar its origination, office workers become little more than skilled machine minders. And those skills that the typist once needed are lessened. 'System 30, a visual word processor, requires *minimum* operator training for maximum productivity,' claims WANG.

Control

'Among the subsidiary benefits management expects to derive from (office automation) is the reduction and thus cheapening of the skills of administrative employees, and not least, the squeezing out of the minutes and hours of labour power lost in the personal relations and contacts among secretaries and between secretaries and their 'principals'.' (Braverman p347)

Office automation will provide the employer with huge productivity gains over the next decade, at little real capital cost. Just as important for the employer though, those gains will be accompanied by a major reassertion of control of the employers over the office work process. A word processor or accounting machine not only increases the productivity of the operator: it also divests the operator of control over his or her own labour.

'The fact that many machines may be paced and controlled according to centralised decisions, and that these controls may thus be in the hands of management . . . these technical possibilities are of just as great interest to management as the fact that the machine multiplies the productivity of labour.' (Braverman p195)

The prospects

There can be no doubt that the office sector, and in particular clerical work, is about to be subjected to a massive rationalisation. The German electronics company Siemens has estimated that by 1990 around 40% of present office work can be carried out by computerised equipment. German trade unions have calculated that this means a threat to the jobs of two million of Germany's five million secretaries, typists and clerical workers.

The Nora report, published by the French government in 1978, estimates that French banks could reduce their staff by 30% over the next ten years by introducing modern computing techniques, and that the insurance industry could make similar cuts.

In the UK, unemployment among clerical workers is already increasing at a faster pace than unemployment overall.

Index of Unemployment by Occupation

	Clerical and Related	Manual	All workers
June 1975	100	100	100
June 1976	147	135	134
June 1977	169	136	138
June 1978	168	132	133

Moreover, unemployment amongst women is rising faster than amongst men: from January 1976 to September 1978, while male unemployment rose 2%, female unemployment rose 67%.

This situation can only get worse if employers succeed in introducing the new technology into the office. And it will be difficult to stop them. Office workers have not had a strong tradition of trade union organisation. It is true that office workers, and women in particular, are joining trade unions at a rapid rate: female membership of TUC affiliated unions grew by 56% in the decade to 1977, and the number of women in the white collar union APEX grew by 92% over the same period. We can expect this trend to continue. The question is whether the unions will fight over job loss, especially when the jobs being lost are women's; are going a few at a time; and are mainly effected by natural wastage or redeployment. It is vital that they do so.

GLOBAL BUSINESS

US multinationals like IBM are making massive profits out of the electronics industry.

The electronics industry has the largest growth record by far of any industry in recent years. In 1977 the world market for electronics goods was already worth £50billion, with the US accounting for well over half of this, and some estimates put it as growing by 20% a year even now.

At the centre of this growth lies the computer. Computers are being applied to areas and products inconceivable a decade ago. The cost of research and development on new products and applications by IBM alone runs at over £1billion a year.

Many of these products are straightforward substitutes for labour; all of them make it easier for employers to rationalise their workforces and reduce labour costs. This alone guarantees demand for the new technology and so ensures a stream of profits for those companies that take advantage of it.

Data processing systems, peripherals and office equipment, worth £30billion a year, are the most valuable section of the electronics market. Add to this the developing electronic telecommunications market, worth another £20billion annually, and you have the heartland of the micro-electronics revolution. The multi billion dollar market for electronics products represents profits undreamed of five years ago, at the beginning of the present economic recession.

The US Multinationals

The US multinationals are taking the lead in developing the new products. The US has always been the world's biggest electronics market. Direct and indirect government purchases, and the special purpose military computer market, together with the massive research and development subsidies provided by the US government, have always given American corporations considerable advantage over their competitors in the rest of the world. During the 1960s the US government market for computers was larger than the whole European market put together. Major technical advances in the development of computers and semiconductors took place under contracts awarded by the US Department of Defense or under the space programme. So it is not surprising that key inventions and the development of the transistor, integrated circuits, and large scale integration all took place in the US. In computers at least, the dominant position bestowed on IBM by this relationship with the US government has never been seriously challenged.

IBM is the world leader, dwarfing all the other companies. It dominates the market in office equipment, private telephone exchanges and military applications as well as computers. Its capitalisation of $45billion exceeds that of the top 20 UK companies put together. Profits have risen from $3.7billion to $5.1billion over the last two years.

Of the 25 companies with the biggest electronics sales figures, 19 are based in the US, with Philips, Siemens and Matsushita as the only outsiders among the leaders. Britain's GEC, for example, comes 29th. But listing world leaders gives little idea of the uneven pace at which the industry is developing. Japanese companies are expanding fastest among the majors, and though still small by comparison with the US corporations they are commanding a bigger and bigger share of key product areas. Recent accusations of Japanese industrial espionage in 'Silicon Valley', the centre of US micro-electronic developments, shows some of the tensions this is evoking.

Particular sectors are expanding at different rates. Microelectronics advances have been mind boggling. Between 1975 and 1977 sales of these 'chips' have increased by 400%. Some of the world leaders in microelectronics production, such as Intel, Signetics, Siliconix, Amdahl and Advanced Micro Devices, did not exist ten years ago. Texas Instruments and National Semiconductors are slightly older but they also are part of the boom in micros.

Domination

Intel was the first company to develop the microprocessor, the miracle chip that contains all the circuitry of a computer, and its growth has been astonishing. Since 1968 its profits have jumped from zero to nearly £150million a year. But the company only has 8,000 employees in ten plants worldwide.

Fifteen companies now dominate world production of the microelectronic circuits business which was worth £2.2billion in 1978.

The micro-chip manufacturers

Company	Sales of Chips 1978 $million
Texas Instruments	660
National Semiconductor	330
Motorola	320
Intel	300
Fairchild	275
Philips (Signetics)	200
RCA	125

Others ($20million – $100million): Rockwell, Advanced Microde, Mostek, General Instrument, Harris, Intersil, AMI, Nippon (Japan), Hitachi (Japan), ITT, Siemens (Germany), Toshiba (Japan), Ses Ates (Italy), Thomson (France).

This excludes production by IBM and Western Electric, which is in house only. (Source: *Financial Times*)

The silicon chip revolution

The micro-chip revolution began in Santa Clara, California, in an area now known as Silicon Valley. Many of the companies now located there were set up by the frustrated employees of the US electronic giants like Fairchild and IBM. More than 40 companies in the Valley can trace their origins to Fairchild alone. The product they developed and exploited was the silicon chip. 'Application houses', the companies that realised the potential of the chips, grew up alongside the laboratories.

"Microelectronics is the foundation technology", says Hinkelman of Semiconductors Industry. "If you're not in it, you're not going to be in almost any industrial process in the future. The world leader in micro electronics will lead the world in everything else." (*New Society* 27.7.78) The threat is not an empty one. The chip's multi-applicability means the companies of Silicon Valley have the replacement component for a huge range of electrical, mechanical, hydraulic and pneumatic equipment. The extent of the integration or convergence of products that this entails has not yet been fully realised. National Semiconductors' chairman reflects on the trend: "we started out as a

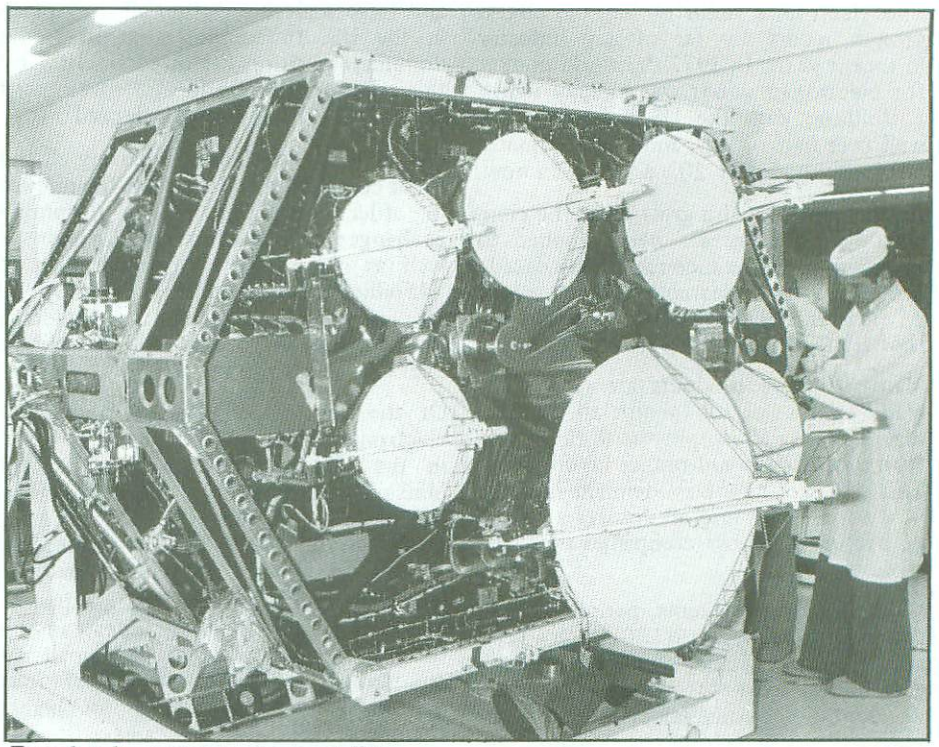
company making semiconductors. In ten years time we will be a systems technology company which also makes semiconductors" (*Financial Times* 24.10.78).

By the time the US giants were aware of what was going on and had started buying their way back into the technology, some of the chip companies already posed a considerable competitive threat. Texas Instruments has become the world's biggest microprocessor producer and also dominates the pocket calculator market. Digital Equipment has cornered the mini computer market, already worth $500million a year, and is competing successfully with IBM and Honeywell. Some of the major corporations, such as RCA, were unable to buy their way back in and had to be content with doing deals for know-how or component supplies.

Product convergence

Convergence is leading to the transformation of whole product areas. Sectors which previously appeared quite separate, such as telecommunications, computers and office equipment, are now merging together. Companies like IBM which have carved out a business in computers are now directing their expertise into telecommunications, office equipment and printing. They have been quick to realise that the new technology is bringing closer the day when they will be able to offer complete information systems that can communicate worldwide. 'Compunications', the new integrated industry, will fairly shortly eliminate a number of existing products as well as a number of the companies operating in this area.

The possibilities of such developments and the potential profits to be made have been quickly seized upon by the major multinationals. The proof is in the frantic reorganisation among the electronics, office equipment and telecommunications manufacturers of the developed world. Any company seeking to supply products must have a foothold in all three as well as in computerisation. A few companies, like Exxon the oil giant, are entering the area for the first time. It has already bought up an office equipment company – Zilog – and is looking for further purchases. Volkswagen too is diversifying in this way, having taken control of Triumph-Adler, the typewriter and office computer company.



French telecommunications satellite.

Keystone

But the major, established electronics companies have a clear lead. They already have the know-how and the technology, and have identified product strategies whereby they can quickly establish monopoly positions in new areas. IBM, for example, has recognised that the compatibility of its products, from word processors through to mainframe computers and business telephone exchanges, gives it immense advantages. An IBM word processor or computer in a company in Europe can communicate with that of another company in Japan without any interfacing problems. That leaves just one link not yet controlled by the IBM monopoly: the actual transmission of the data between the two processors or computers. And IBM is moving fast to establish a monopoly here as well.

Data transmission

Wiring computers together is not new, but the concept of global systems of data communication is only now being realised. It is being built on communications satellites that, together with their land based support systems, require immense capital investment but can handle huge amounts of data. There is clearly little room for many competing systems. IBM, AT&T, General Electric and ITT are among the few companies trying to ensure they get part of the action.

The first of these systems is already being set up in the US. Business Systems, jointly owned by IBM, Comsat and Aetna Casualty, a major US life insurance company, will offer a satellite data transmission service to companies in North America from 1981. Similar systems are planned by other companies.

There are constraints to the extension of such a system beyond the US, mainly in the form of national state telecommunication monopolies. Yet they will be forced to do a deal with those companies that eventually emerge with control of the US data transmission market, simply because of the dominant position that market holds in the world.

The implications of a global information network are inestimable. Clive Jenkins, head of ASTMS, one of the UK's largest

white collar unions, estimates that in little more than a decade clerical work will be exported to the low wage areas of the world via this kind of system (On Line Conference, London 7.3.79).

Multinational involvement in this area led Simon Nora to warn of the possibility of IBM becoming 'one of the great world regulatory agencies', in his report to the French government. This is no empty warning, as the Indonesian government found in 1977 when it attempted to nationalise the distribution and servicing of foreign products. IBM threatened to pull out leaving computer systems supplied to the government and companies inoperable. The threat of 'absolute chaos' forced the government to exempt IBM's business from the regulations. (Source: *Asian Wall Street Journal* 6.10.77)

'All our competitors are going to find the going much much tougher than we will. They will be wrapped up in half baked schemes to buy an integrated circuit business while we already have one.' (IBM Chief Executive *The Times* 15.9.78)

Europe

In Europe there has been a stampede of electrical companies and other interested manufacturers trying to get in on the microprocessor revolution. Yet European technological developments in this area have been negligible. Although a number of Europewide attempts have been made to rectify what were seen as glaring deficiencies as early as 1976, nothing came of them.

Now that the possibilities of the new technology are becoming clear a different attitude is emerging. **'The prospects for microprocessors in any walk of life are frightening. It's lingering death if you don't get in on the game."** (A. Frankel of Staveley Industries)

Today there are extensive deals between individual national companies in Europe and US corporations with know-how in the new technology. The most well known is the recent deal between GEC and Fairchild Camera of America, but the trend was started as early as 1976 when Philips took over Signetics, the US semiconductor manufacturer. Siemens too has had a long standing 'know-how' agreement with Intel (US).

In the last eighteen months similar alliances have been forming thick and fast all over Europe.

How European companies buy microprocessor know how

European Co.	US Corporation	Deal Made
GEC	Fairchild	Know-how
Racal	Milgo and Vadic	Take-over
Plessey	Rolm	Licence agmnt.
Lucas	Siliconix	25% share
Ferranti	Interdesign	Take-over
ICL	Singer Business Machines	Take-over
Staveley Industries	Electroscale	Know-how
Thomson (France)	Motorola	" "
Matra (France)	Harris Data Communication	" "
St Gobain (France)	National Semiconductor	" "
Siemens (W. Germany)	Advanced Micro Devices	" "
Bosch (")	Fairchild	" "

Source: CIS

Since most of the European companies make products affected by microprocessors, buying into the new technology is the quickest way to make up lost ground. Any ideas though that these deals would give European companies access to the lucrative American market were short lived. Like the Plessey agreement with Rolm of California, any advantage obtained normally means agreeing to exclusion from all but the home market.

Further doubt has been cast on the value of these deals by an EEC report published in October 1978. The subordinate technological position of the European companies is unlikely to be overcome. US companies, it suggests, are not likely to provide potential competitors with any advanced know-how. These links are 'primarily a way for US companies to get injections of much needed equity capital' (*Engineering Today* 4.10.78). European companies, it goes on, might be paying through the nose for quickly redundant technology.

One Wall Street analyst commenting on the GEC Fairchild deal said; 'I suspect that it's a case of getting some GEC money and giving GEC what it thinks fit for the UK. How can GEC keep tabs on the Fairchild labs in the US?'

Certainly the US corporations stand to gain most. Europe is the fastest growing market for electronics products, particularly as office automation is not as advanced as in the US. The deals then probably represent the first moves in the battle for the European markets. As the battle hots up tariff barriers are almost bound to be set up against foreign products by the EEC. Companies that establish a stake now are likely to get preferential treatment from EEC governments.

The massive growth predicted for electronics products in Europe has placed the UK at the centre of these developments. The pace is being dictated by US computer and component companies. For them, the UK has a number of advantages. Apart from providing them with a secure foothold in European markets, the UK, through state aid and incentives, has traditionally been generous to US multinationals investing here. Added to which, the UK provides a pool of skilled and unskilled labour at wages that are low by European or American standards.

The US corporations have a formidable presence in the UK already. The central belt of Scotland is already known as the UK's 'Silicon Valley'. The leading microprocessor companies National Semiconductor, Motorola, General Instruments and Mostel make chips there and the big computer names like IBM, Burroughs, Sperry Univac, Honeywell and NCR also have plants in the area. Elsewhere in the UK, Texas Instruments, Digital Equipment, Control Data and ITT are also manufacturing microelectronic components and equipment.

Britain

Despite this Britain is a net importer of electronic products. In 1978 exports amounted to £1.9 billion (lower than the previous year) while imports were £2.4-billion (£0.4 billion higher). As a result the trade deficit in this sector reached £0.55 billion – a 230% increase over 1977.

The picture then is of a UK market dominated by US manufacturers and imports. So it comes as no surprise to learn that few UK electrical companies have invested in or kept abreast of microelectronic developments. Some clues to

GEC's Weinstock is seeking closer ties with the US.

Popperfoto

this state of affairs is provided by the recent history of the three major companies concerned, GEC, Plessey and ICL (International Computers Ltd.).

Over the past ten years there have been several attempts to encourage development of these companies in just the directions that are now regarded as so important, but with little success. In 1972 *The Times* leader wearily remarked that 'government aid is once again being directed towards the micro electronic industry. This to encourage the development of integrated circuits. This sounds familiar. Didn't Mr Anthony Wedgwood Benn's Ministry of Technology try a similar injection of money in an attempt to stimulate this particular industry a few years ago?'.

GEC

A fair proportion of the government finance at that time went to GEC. But, for reasons that are not entirely clear, GEC later pulled out of large scale integrated circuit manufacture entirely. Until then it had run Britain's most advanced MOS plant at Glenrothes in Scotland. It seems that long term considerations could not overrule Weinstock's policy of cutting anything that was not immediately profitable. As the *Financial Times* put it, 'GEC's record in semiconductors is far from impressive. It failed in the early 1970s to anticipate the intimacy of the connection which is now developing between design of electronic systems and know-how in semiconductor production' (24.11.78).

GEC is left without any significant stake in the new technology, so it has rapidly – some say desperately – sought a technical alliance with Fairchild of the US. Before the present deal there were rumours that GEC intended to use its 'cash mountain' to takeover Fairchild – spending, in effect, what it had saved on development in earlier years. But instead they have to pay for a treaty of co-operation with Fairchild.

GEC is spending elsewhere in its attempts to get a foothold in new technology products. It has just bought the US office equipment manufacturer A.B. Dick for around £52million. Reckoned to be a 'mature', technologically backward company, this does at least give GEC a foothold in the vast US office and print equipment market, as well as a range of products, albeit in need of innovation, in that sector. GEC is said to be seeking similar purchases in telecommunications components and defence equipment. It has also put in a so far unsuccessful bid for Avery, a UK weighing and measuring equipment manufacturer – another sector that is rapidly moving over to the new technology. Moreover GEC has also recently purchased Boonton Electronics in the US and 49% of Sunair Electronics in Canada. According to stockbrokers Laurie Millbank & Co. it is all part of a plan whose most important part 'is that it will give GEC a presence in every aspect of electronics information and hence will enable them to bid for turnkey operations'. Yet clearly none of this will be sufficient to put GEC back on anything like equal footing with its US, Japanese and German competition.

Plessey

Plessey's track record is no better. Although the company has a £14m semiconductor business based on plants in Swindon, Plymouth and Towcester, the product is highly specialised and dated. No attempt is to be made to modernise and Plessey management have offered to sell the business to GEC or General Instruments of America.

Plessey's chairman, Sir John Clark, has clearly grasped the significance of the new technology. "Your company," he told shareholders, "is ideally placed to take advantage of the converging technologies of the future." But far from converging, Plessey's fortunes are flying apart.

Plessey sold off its 25% stake in ICL shortly after Clark had announced that the stake was an integral part of the company's future. "Sir John regards backing ICL as his great success over Sir Arnold Weinstock" (*Sunday Times* 22.10.78).

Plessey has also lost key executives, particularly in the telecommunications side of the business, and the once lucrative Post Office contracts have become an albatross around the company's neck. Closures in that sector have already cost them £27million and word is out that the management are desperate that the telecommunications business be nationalised and taken off their hands.

Private telecommunications is a different story, though even here Plessey has some problems. For both Plessey and GEC the private business exchange (PABX) is central to their office systems development strategy – but here they are up against the US companies, and IBM in particular. Plessey claims to be in the lead in the UK with the first fully digital PABX. But a crucial part is made by Plessey under licence from Rolm of California, and the licence expressly prohibits sales outside the UK. Again the lack of research and development bites home.

Plessey's profit record has been poor, managing only last year to get back to the levels achieved five years earlier. In the City the talk is of 'breaking up' Plessey as the only solution. The company's most profitable area, Plessey Electronic Systems, is being sought by Racal, the military equipment and electronics company.

The government too seems to have little sympathy for Plessey. Sir John Clark's

consistent opposition to government-backed national policy for the industry has made many enemies at Whitehall. As one government planner put it, "whenever we try to create a strategy for the key high technology industries of the future we come back to the same problem. What do you do about Plessey?".

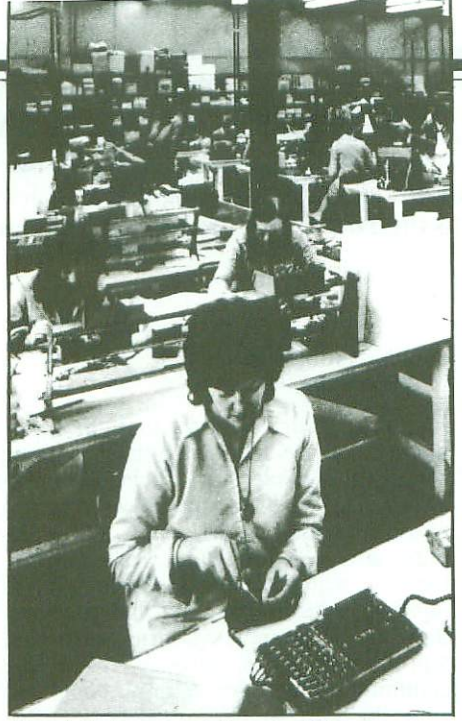
ICL

ICL is the only UK 'success story' in the computer industry. That, however, is more the result of heavy protection in a rapid growth market than of any great technological achievements. Since its formation in the late 1960s, the company has benefited from both government cash support and preferential purchasing by public authorities. And Britain's colonial past has provided it with export markets in countries such as South Africa (where it supplies the police force amongst other repressive organisations), Nigeria and India.

ICL has a purposeful policy of making equipment and systems that are not compatible with other makes of computer, and IBM in particular. Many of IBM's other competitors, such as Amdahl (part owned by Fujitsu), make machines which can use IBM hardware and software, so that the customer does not face problems in switching from one to the other. This has proved a highly successful policy, allowing Amdahl to build a large market amongst former IBM customers.

ICL argue that the 'plug compatible' manufacturers are vulnerable to the onslaught of new IBM machines, so it has to provide complete systems of its own design. The result is a heavy emphasis on software and support aspects, with many components brought in and less than one-quarter of the 33,000 workforce engaged in manufacture.

For the moment ICL can survive – there is room enough in the booming international marketplace, and its existing customers are reluctant to move to other suppliers simply because ICL equipment is not compatible. The main question though is whether ICL can move fast enough as prices plummet over the coming years to cling on to its existing market position.



Racal factory – civil and military electronics.

Companies such as ICL, Plessey and GEC will be increasingly overshadowed by the major multinational electronics companies in the coming decade. These have the technological and financial resources to pour into research and development and to back developments as they become exploitable. Above all though, a company like IBM can literally dominate international markets.

Compatibility is a vital ingredient in this respect. Computers can only communicate with one another without special interfacing equipment if they use common logic and systems. So IBM computers, for instance, are designed to be compatible with one another the world over. If a multinational company buys IBM computers or word processors for its offices in the US, Europe and the Far East, it knows that it will be able to link them up when it wishes via telephones or satellites, at some future date, with little difficulty or expense. And IBM word processors can, in addition, communicate with IBM computers.

It is difficult to overstate the strength of IBM's position: it is underlined by the existence of many firms making 'IBM compatible' equipment. IBM sets the standards that everyone else has to follow. Purchasers of office and communications equipment are virtually driven to buy IBM by the knowledge that it does have a monopoly world-wide and that only by doing so can they be sure of being able to communicate effectively between their own offices, with other organisations, both nationally and internationally.

IBM's profit margins are so large that it cannot be undercut sufficiently for its competitors to offset these marketing advantages. If competitors attempt to do so, IBM simply cuts its own prices, and still makes healthy profits. As a result its competitors tend to wait for IBM to give the lead in cutting prices, and so IBM has effectively been able to retard the price cuts that would otherwise have resulted from progressive electronic miniaturisation.

GEC is one of Britain's largest private employers, and one of its most profitable companies. But it is spread across many products and industrial sectors, from diesel engines through to micro-electronics. Its total sales in 1977/8 reached £2343million, profits £344million.

How can it, or any other UK electronics company, hope to compete with IBM, a company whose 1978 sales of £10,300million and profits of £3,150-million were made almost entirely from electronic equipment?

ICL and the major US computer manufacturers 1976/7

	Sales	Pre-tax Profits	Margins	Increase in Profits 1972/3 to 1976/7
	$ million		%	%
ICL	766.2	55.4	7.2	+148.3
Burroughs	2126.8	394.1	18.5	+ 89.7
Control Data Corp	1512.8	47.5	3.1	+ 45.2
Digital Equipment	1058.6	176.4	16.7	+374.2
Honeywell	2911.1	235.5	8.1	+ 51.6
IBM	18133.2	5092.4	28.1	+ 72.8
NCR	2521.6	269.0	10.6	+ 89.5
Univac	1437.9	96.3	6.7	+ 95.7

Source: Laurie Milbank 1978

THE POST OFFICE

The whole field of telecommunications is changing, with job losses among Post Office workers and a threat to the Post Office monopoly from large private companies.

The electronic office is on the horizon. According to Mr David Bearham of the Post Office External Telecommunications Executive, "We will have the situation where large electronic offices communicate with large electronic offices and if we don't take the business, IBM will."

The largest element of growth in the Post Office service at the moment is international telecommunications. Inland traffic has increased by 16% since 1974, while international traffic, including transit calls, has increased by 150%. This international traffic is overwhelmingly dominated by business use. According to Mr Bearham out of 150million international calls made last year, less than 20million were for purely social purposes.

The Post Office has deliberately set out to encourage this business use of its international service and boasts that one of the reasons for the presence of large numbers of foreign multinationals in London is the service that it offers. In 1971 the Post Office started a service called International Leased Telegraph Switching which provides private international switching services for international companies. Mitsubishi, for example, routes all messages between its worldwide offices through London, and their traffic can total about 19,000 messages a day. Over 30 corporations have availed themselves of this service since it was set up. Much of this traffic consists of data being transmitted from one data base to another around the world.

There is no question that the development of the 'computerised office', particularly with mini computers tying in to larger data bases, will lead to a massive growth of inland data communications. Data telecommunications connections are growing at about 17% per annum, and they use both public switched networks and private circuits. In order to gear up for this growth in traffic, the Post Office is proposing to introduce new digital transmission systems for its national network. G. Dale, Head of Post Office Data Communications recently stated that 'forecast demand for data transmission can now justify purpose built public networks, and most telecommunications administrations are either planning or implementing them.'

The Post Office believes that the introduction of the new technology is going to alter the whole field of telecommunications, and is looking forward to a massive explosion of electronic communications in the future. New capabilities are being offered in such areas as rapid message preparation and transmission and facsimile transmission and reproduction. The costs of electronic communication are falling compared with the cost of traditional Post Office mail services, and at present facsimile transmission of an A4 page is half the cost of first class mail. Any office that introduces new technology will, with very little expense, have a facility for electronic mailing.

Certainly as the Post Office tries to expand its Prestel system and enhance the service it is offering, the threat to jobs of postal workers will grow. Already under constant pressure to raise their productivity and accept manning reductions, the growth of alternative electronic services will reduce their role even further. They will be caught in a vicious spiral of a declining service, the loss of business traffic and falling income from the service, leading to more redundancies and higher postal charges.

Another group whose future is in doubt are the Post Office engineers. They install equipment like telexes and telephones, work in the exchanges and carry out repairs and maintenance on all Post Office equipment. Largely members of the Post Office Engineering Union (POEU), they are skilled workers who exercise a relatively high level of control over their own work. This is built into the structure of the Post Office at many levels. For example, Union agreement is needed before new tools are introduced or new equipment is brought into service.

System X

The planned introduction of System X, the new computerised exchange and transmission system developed by the Post Office threatens to attack not only the jobs, but the content of the jobs carried out by the Post Office engineers.

System X is designed from the outset to be compatible with and benefit from the

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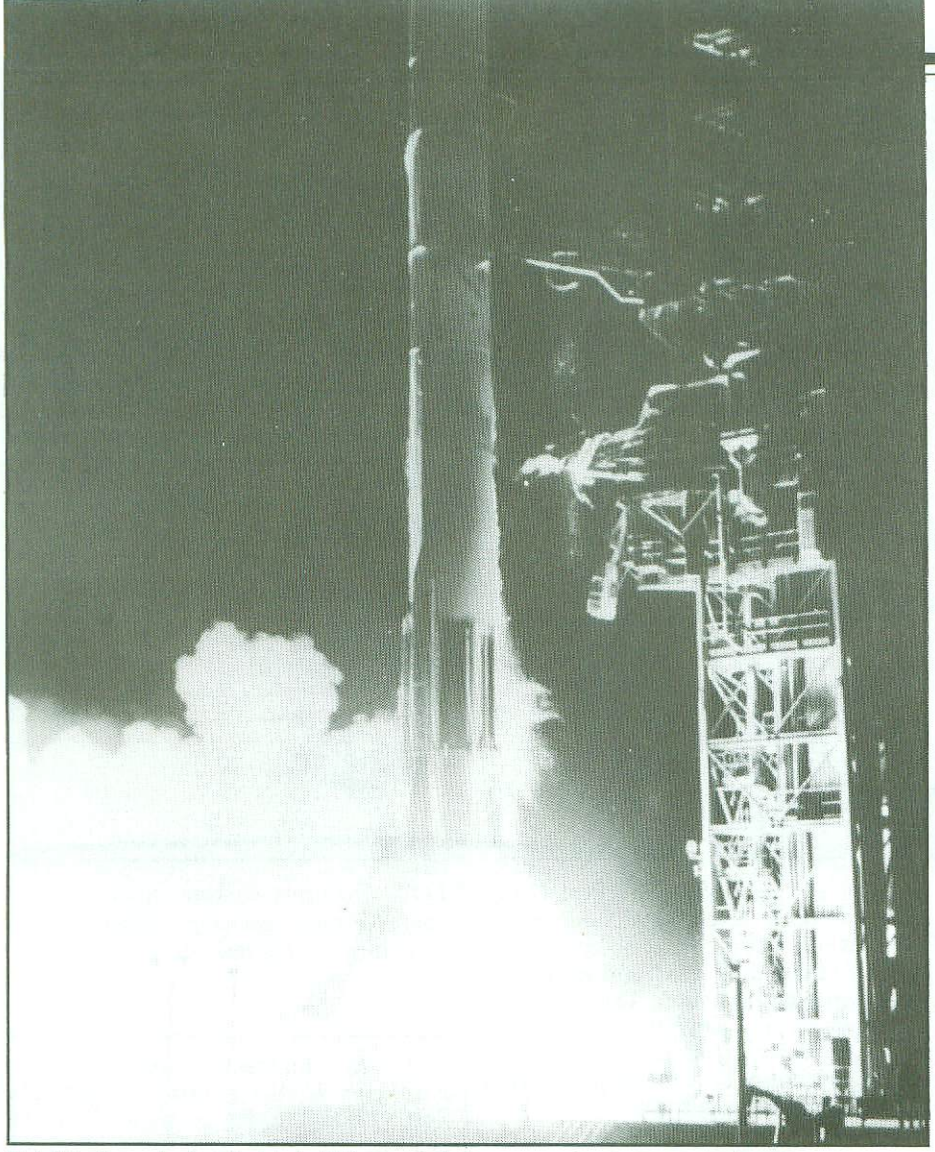

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Satellite launch. Intelsat is building a global communications network.

latest developments in micro-technology. Most of the Post Office equipment in use at the moment relies on mechanical switches in the exchanges to route calls, and on analogue (wave form) transmission of the signal. The Post Office points out that this method has several drawbacks. It is relatively slow to set up multi-link calls, and the signal is prone to distortion and loss over long distances.

System X will rectify these faults so that transmission is speedy and trouble-free. By introducing electrical switching in the exchanges, calls can be set up faster and more reliably. Also, with digital (instead of analogue) transmission not only is the signal distortion-free, it is compatible with modern computer systems and data transmission.

A further aspect of System X is that it has stored programme control. The operation of the exchange, or any part of the system is controlled by a computer programme stored in a microprocessor in the system. Using this system, lines can be added or removed from service by putting into effect part of the programme. As the 'Post Office Maintenance Proposals' booklet points out, the new system is fully automatic and self checking. It avoids and arrests faults, and can automatically locate them to a single replaceable unit. The current system, it concludes is highly labour intensive, and this will be rectified by System X.

Dial-job-loss

This automation will have several effects. The fully automatic exchanges envisaged for System X greatly reduce the need for maintenance. The development of modularisation will make units cheap to replace, but expensive to repair. Secondly, the use of remote self-checking facilities inherent in the system means that many exchanges will be completely unattended, and monitored automatically from a central exchange. Little maintenance will be needed. A small team located in a large exchange, monitoring other exchanges will suffice. As the Post Office booklet says, the effects of the design are that staff requirements are reduced and only minimal manipulative skills will be needed.

Exact figures on future job loss to be caused by System X are unknown. In other countries the effects of modernisation have included severe reductions in staffing. In the US the introduction of Stored Programme Control halved the requirement for maintenance and doubled manpower productivity through centralised maintenance. At two sites in Canada, maintenance workers per 10,000 lines were reduced from 9.4 to 3.75 and from 11.0 to 1.7 respectively, following the introduction of an electronic system.

In Britain, the Post Office has not been prepared to discuss the staffing effects of System X. The Post Office Engineering Union (POEU) has stated that there are no agreed staffing standards. The Union is confident that the staffing levels can be maintained because there is a great deal of growth potential, and that this coupled with retraining and re-deployment could ensure the maintenance of staff levels. The union is committed to a thirty-five hour week and no redundancies.

This position is not going to succeed without a severe conflict with the Post Office. At the moment work is being carried out on the introduction of semi-electronic exchanges, TXE4s, which are an advance on the Strowger electromechanical exchanges, although they are not completely electronic and do not have computerised control. Even for this equipment, the reductions in manpower requirements are quite startling.

Confidential Post Office documents show quite clearly the staff cuts it will seek as the whole of one area is given over to TXE4 equipment. This is the City area, in London. The documents compare existing manning levels, against projected manning levels, after the introduction of TXE4, for all the exchanges in this area, and give aggregate staff levels up to 1996.

The high point for staffing levels is 1980, when the 'Director' exchange, which covers all the local exchanges, will have 258 staff. By 1996 the Post Office predicts that this number will be reduced to 98. This is on the basis that by 1994 all Strowger equipment is replaced and

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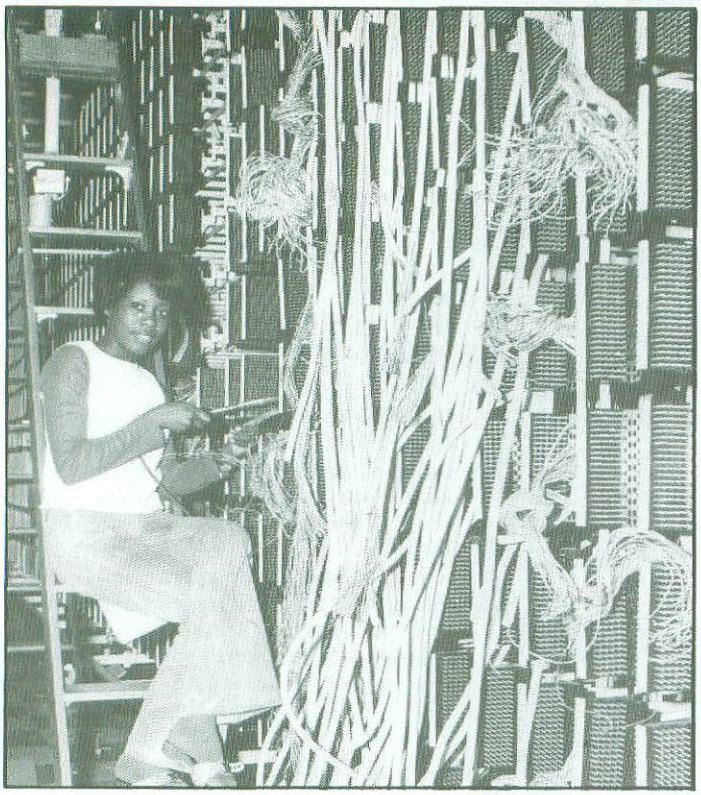

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Left: Engineer working on a semi-electronic exchange. Right: Satellite receiving station.

the staff grade of T2A technician is abolished.

At a local exchange level, the cuts become even clearer. By 1981, the 407 Southwark exchange should be working on TXE4 equipment. Of 14 staff currently allocated to this exchange by the Director exchange, only three will be required by 1981, leaving a surplus of 11. In the same year the projections show three surplus staff in 790 exchange and seven surplus staff in 623 exchange. These figures may not be the final outcome, they may have been revised down slightly already. **But it is important to note that they take into account the commissioning of five new exchanges, to cope with new traffic, but not of the introduction in the area of System X equipment, where staff requirements will be even less than that for TXE4.**

Deskilling

Without a strong argument that the benefits of modern technology should result in reductions of working hours and the creation of work sharing in the Post Office, it will be difficult for the POEU to justify the maintenance of existing manning levels.

The other aspect of the introduction of System X is the effect it will have on the level of skill required, and the element of control that can be exercised by the workforce. In the area of maintenance work, faults can be diagnosed, repaired or replaced automatically. The Post Office plans to open several telephone shops soon, where customers can choose the type of phone they want, and see various extension plans in action. This can easily be extended to allow the customer to exchange faulty equipment for new sets. A great deal of outside maintenance work can be abolished in this way.

Futures

Foreign telecommunications unions have experienced similar effects of deskilling with the introduction of new technology. The Japanese union, Zendatsu, has said that the daily work of technicians was being reduced to merely watching fault detection devices. Italian unions noted that telephone repair workers now visit customers to replace telephones, not to repair them. All of these problems will be raised by System X.

In Australia, a similar maintenance structure to that proposed for System X has been introduced. The Australian union comments that it threatens to create divisions between skilled maintenance personnel and the relatively unskilled workers in exchanges who merely perform simple functions like replacing faulty circuit boards.

The technological changes in computing and processing science are going to have great effects on telecommunications in the future. As data transmission grows in all its forms, the large multinational companies are pressing to be able to share and make use of that technology, or capture a large part of the growing market. The Post Office is trying to respond to that challenge from the companies like IBM, and argues that the best way to do so is to continue to offer the best service to business that it can. It is notable that System X is only necessary because of the large growth in computer data transmission traffic. It will be many years after bringing it into service that any benefits will be felt by the private telephone subscriber. Yet this drive for efficiency to satisfy the needs of business threatens to mount the most severest attack yet seen on the jobs and conditions of a large and skilled workforce. Post Office engineers are already very productive, producing for the Post Office about £80 per week each in profits. Yet the argument from the Post Office is that in the future this will not be enough, and that jobs and conditions will have to go.

The new technology is designed to cut jobs in the industry. Each Post Office worker is at the bottom of a pile of vested interests who range from the manufacturers of equipment to the multinational banks. All can foresee a considerable fortune from the take off of advanced technology in the telecommunications industry.

Private Exchange

The growth of office communications depends to a very considerable extent upon the private automatic exchange (PABX) becoming increasingly sophisticated and taking on a wide range of facilities. The PABX is the exchange which links the external public system to the private internal system of a company. The Post Office foresees an increase of 70% in the number of connections to private automatic exchanges, and it is not surprising that competition in this field is growing. It is coming from the companies that traditionally have been concerned with computing rather than telecommunications.

The Post Office installs and manufactures any PABX under 100 lines capacity, so only the larger ones are sold directly by the private manufacturers. The so-called free market for PABXs in this country is worth about £40million a year, inviting constant lobbying by the manufacturers to break the Post Office's monopoly over subscribers' apparatus, and thus enlarge what is already a very lucrative market.

At the moment the Post Office authorises 13 different types of PABX. The market is dominated by IBM, a very recent entry to the business, with their computerised model the IBM 3750. This has stored programme control and a data acquisition facility. Since it was approved by the Post Office in 1976 IBM's share of the market has risen from 13% to 40%. The IBM machine is expensive, costing half a million pounds, but with its highly developed technology it can complement the highly automated office of the future.

General Telephones and Electronics is introducing a new PABX specially designed for the hotel industry. It offers automatic alarm calls, automatically records and pages for incoming calls, as well as having a table top printer and Visual Display Unit for access and reproduction of accounts and other records.

As the range and sophistication of the new equipment grows, so dissatisfaction over the control of the market exercised by the Post Office increases.

Keystone

Alongside this pressure from the manufacturers who want to supply and install their own equipment, comes pressure from the large companies who want to benefit from the new technology. Companies like Unilever and Ford operate their own large private national telephone networks, either using their own microwave transmission or leasing land lines from the Post Office. With their financial muscle they want to deal directly with the manufactures in order to get tailored telecommunications systems.

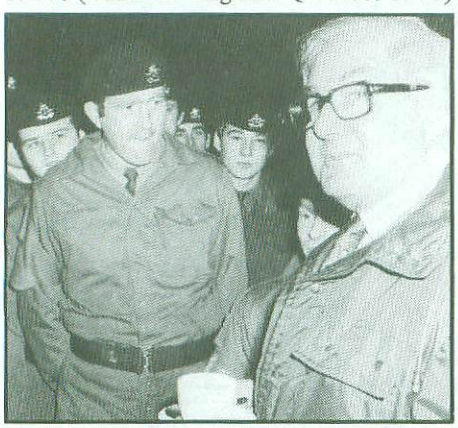
A committee set up in 1976, by Eric Varley in the Department of Industry, recently produced a report on the future of computer networks. Representatives from Ford, National Westminster Bank, the computer industry and other major companies, were included on this committee. The report says the Post Office monopoly on providing connections to the telecommunication networks should be removed. The report also urged that subscribers should be free to attach any approved equipment to the Data Terminal interface on their premises. It also recommends that private enterprise should be allowed to bid for licences to provide switching services in competition to the Post Office. **The proposals, if implemented would reduce the role of the Post Office to just a common carrier, with responsibility for the public networl but with no control over peripheral equipment and facing competition on many of the services that it now operates.**

This position is similar to that stated by Sir Keith Joseph and the leadership of the Tory Party, who have long held a position that the profitable areas of the Post Office's operations should be hived off and opened up to the private companies. As the growth of the telecommunications industry accelerates, and the markets for private exchanges, private transmission systems and the machinery to plug into it grows more lucrative, the Post Office will be under increasing attack.

THE JOBS DECEPTION

The British Government has launched a massive propaganda campaign to encourage the use of the new technology, while glossing over the unemployment that will result.

The Labour government in office in Britain from 1974 to 1979 oversaw a massive transfer of wealth – away from working people into company profits. The share of real company profits in the national income rose by over 50% between 1975 and 1978, admittedly from a very low level, and the real rate of profit rose by 17% in the two years from 1975 to 1977. (Bank of England QB Dec. 1978)



Working-class living standards fell sharply. Real take-home pay was kept down in two ways. Pay rises were strictly limited by the Social Contract and taxation took an even larger share of wage-earners' incomes. Unemployment rose to new postwar records, and welfare services were cut either directly or by imposing cash limits.

Decline

Meanwhile, the government removed taxation from company profits almost entirely. **By a series of devices including allowances for stock appreciation and deferred taxation, the entire burden of taxation was in effect shifted onto wage-earners. In 1977 the Treasury admitted that corporation tax was 'negligible'.** At the same time it handed out millions of pounds in direct and indirect assistance to companies, in the form of regional aid, investment aid, and special employment assistance.

In 1950 Britain had 25% of the world's total exports of manufactured goods. By the mid-1970s that share had fallen to less than 10%. Since 1960, the growth rate in the UK has been less than any of its major competitors', and this has been even more marked in the years since 1973.

Table 1: Growth of output in manufacturing industry
Percent per year

	1960-73	1973-78
United Kingdom	3.0	–0.9
United States	4.9	2.5
Canada	5.9	2.8
Japan	12.0	0.8
West Germany	5.3	0.8
France	5.9	1.4
Italy	6.1	2.2

Source: Bank of England QB March 1979

The slow growth of the British economy, and the declining success of British exports has been matched by lack of investment and slow growth in the productivity of labour compared with other competing economies. Between 1973 and 1978, while productivity in the UK rose by only 0.6% per year, in the US it grew 2.2%, in West Germany 3.3% and in Japan 3.7%.

To improve Britain's international competitive position and growth rate, the UK government is looking for any way to boost productivity. The adoption of the new technology throughout industry as fast as possible, regardless of the social consequences, is seen as one way of achieving this.

To ensure that this happens, the government is taking a number of measures – propping up the domestic electronic industry via the National Enterprise Board (NEB), offering financial assistance to companies to adopt the new technology, and embarking on a massive exercise in 'industrial indoctrination', aimed at both managements and unions, to convince them that the new technology is in their best interests.

In September 1978 the Department of Industry set up a new Electronics Application Division with 'the task of stimulating awareness of the competitive advantages offered by microelectronic techniques – in particular microprocessors – and encouraging their adoption by companies in all sectors of British industry and commerce where they can be of benefit.' (*Everyday Electronics* Sept.1978)

PA Management, a private public relations firm, have been appointed by the Department of Industry to do the footwork involved in the microelectronics awareness programme. The company has the job of identifying and reaching what the Department of Industry refers to as the 50,000 decision makers among management and unions. The programme is due to start in summer 1979 and to take three years at a cost of £10m. For the very top level decision makers, the Department has employed persuaders from the Californian Stanford Research Institute.

For management, persuasion is backed up with financial inducements. There is money from the Microprocessor Application Project Consultancy service, which subsidises the cost of sending personnel on education courses in the new technology, and there is money from the government for investment.

State investment

The government subsidises private companies directly in two ways. The electronics industry itself receives money from the Microelectronic Industry Support Programme, which so far has £70million in the kitty. For companies wishing to use microprocessors in their production methods, or in their products, there is money from the Microprocessor Application Project, to which £55million has so far been committed. These are over and above all the other support programmes the government already has in operation.

The recent GEC-Fairchild development in Cheshire is a good example of the kind of subsidies on offer. The land, made available at market price under the Community Land Scheme, was provided with an infrastructure of drainage, access, services and so on free of charge. The Department of Industry gave over £7million in grants – mainly regional developments grants. The rest of the £20million cost came from the Microelectronics Industry Support Programme. GEC-Fairchild get the entire factory for the cost of the land alone.

National Enterprise

The money so far committed to these attempts to cajole private industry into taking up the new technology is not large in the context of the industry as a whole. There will be more forthcoming if it is all spent but so far the government has not

Keystone

succeeded in persuading private companies to take up its offers. In 1977, for example, 22% of the funds available for industrial research and development were left unused.

It is because British management is reluctant to invest, and conservative in the face of new ideas and techniques, that the government has had to emphasise the propaganda side of its intervention so much.

The most widely publicised, but least understood, arm of the government's strategy is the NEB. According to left Labour MP Eric Heffer the NEB was set up to be 'an instrument of Socialist transformation'. In fact it has become a state investment bank, operating on commercial criteria, extending risk capital to fill a gap in the private banking system.

inmos

When the NEB was formed in 1975 it inherited the government's nationalised shareholdings in a number of companies. Though the NEB was and is dominated by British Leyland and Rolls Royce, it also received shares in several electronics companies, notably Ferranti, the arms and electronics manufacturer, and ICL, the country's only mainframe computer firm. ICL was created with active government encouragement by the merger of several smaller computer firms in 1968. Since then it has enjoyed a degree of protection, by being given preference in public sector purchasing. IBM have alleged that ICL enjoys a price preference of 25%.

Through 1976 and 1977 the NEB bought into a number of smaller electronics companies, particularly in instruments, computer peripherals, and, through its subsidiary Insac, in software. In 1978 it announced its intention to invest £25million in a new company INMOS, to design and manufacture integrated circuits. The company is to concentrate on the next generation of chip products, in particular a mass-produced general application chip known as the 64K RAM memory chip. A further £25million is

Petritz, Barron, and Schroeder of Inmos.

available. The stated justification for this venture is to ensure that the UK electronics industry is not dependant on foreign suppliers for the basic element – the silicon chip.

INMOS was founded by two Americans, Richard Petritz and Paul Schroeder, founder and design engineering director respectively of Mostek, a leading US microelectronics firm. They were joined by Ian Barron, an English computer consultant, who introduced his colleagues to the idea of NEB funding. INMOS was a company in search of risk capital, an increasingly rare commodity in the USA. It didn't take much to convince the NEB that what its electronics sector lacked was a developer and producer of the most up to date electronic devices.

From the beginning INMOS ran into a number of criticisms. The Department of Industry itself was alarmed at what it saw as a reckless move into the mass volume market dominated by the US and Japanese firms who had the development of their own 64K chips already under way. In January 1979 Motorola announced that it had a 64K RAM device scheduled for sample deliveries in the spring – the latest in a series of such announcements coming from Fujitsu, Texas Instruments and Mostek. With peak sales for the 64K RAM projected for 1983, many in the private sector also thought INMOS would be too late to cash in on the market for this particular product. It was also argued that competition with firms doing similar work independently, such as GEC-Fairchild, could lead to job losses in the UK.

Other criticisms of INMOS were that the peak funding of £50million was only a drop in the ocean compared to the Research and Development investments of competing firms like Texas Instruments which spent £100million on research and development in 1978 and £150million on capital investment. The projected jobs to be created by the new firm – 1000 in the US and 4000 'eventually' in the UK – would make hardly any dent in the UK's unemployment crisis, and any jobs arising from INMOS-produced applications and assemblies would be sited in the cheap labour areas of the far East. At least 20% of UK jobs, even if sited in high unemployment areas, would be for highly skilled, non-local technicians. In addition 'founders and future employees' of INMOS were given the opportunity of purchasing up to 27.5% of Ordinary voting shares, though the NEB shareholding is Preferential. Those who set up INMOS then have the chance of becoming millionaires at the tax-payers risk.

Red Herring

The publicity which has attended these criticisms missed a vital point. The 64K RAM, which caught the attention of the press and the indignation of Tory stalwarts such as Keith Joseph, is in reality something of a red herring. INMOS is basically a technology company. Its job is to keep abreast of and contribute to new developments in both components and applications, including products such as word processors and industrial robots. If its 64K RAM chip is competitive with the American, Japanese, or for that matter German versions, well and good. But INMOS's main importance is to the government's overall economic strategy not just as a competitor in the chip market.

At the end of January 1979 the NEB announced a major initiative in high technology office systems with an investment of £15million in a new subsidiary, Nexos Office Systems. Simultaneously Logica, a company in which the NEB also has a stake, announced the formation of a new company, Logica VTS. Nexos and Logica will work closely together to supply a wide range of word processing products. Logica VTS will be responsible for production and development while Nexos will look after marketing and support. A further £25million may be required 'as new product opportunities arise'.

Union opposition is hardly a problem. The news of the launch of Nexos was warmly welcomed by David Cockcroft, research director of APEX, the office workers union, who has been urging the government to put money into office systems 'to keep the UK ahead in the technology stakes'. The recent NEDC report on office machinery says that UK companies are so uncompetitive that foreign multinationals should be encouraged to manufacture word processors in the UK.

It was also announced in January that over £50million was to be invested by the government in fibre optics and opto-electronics through its Electronics Components Sector Working Party. The new programme would echo the pattern of government investment in microprocessors and add to it the 'education of potential'. In other words we can expect large amounts of money to be spent on pushing fibre optics 'awareness' as well as on its development.

Unemployment

The government has consistently denied and ignored the social consequences of these policies. Unemployment has risen dramatically since the late sixties, from around half a million to a more or less steady 1½ million. With the number of young people leaving school and entering the labour market – 800,000 by 1982 – the government knows that to reduce unemployment to a mere one million would in itself require 1.2million *new* jobs. Yet these figures do not take the impact of new technology into account at all.

The official government position is that more jobs will be created than lost; this is the conclusion of the 'Think Tank' report, and the many NEDO reports and government documents. They say that jobs will be created in three areas: the production of silicon chips themselves, computer programming and service industries.

With silicon chips, production is highly capital intensive, employs very few people, and is international, with much of the work taking place in the US and South East Asia.

In computer programming, rationalisation

is taking place with the introduction of the new technology. 'Monolithic' programming, where one programmer works on a complete programme is being replaced by 'modular' programming, where different programmers each produce a small part of the finished programme, and end up doing very similar tasks over and over again.

In this way the productivity of programmers will be increased as their output can be measured and controlled, and the 'hairy programming genius' engaged in a 'creative art and immune to managerial control' will be a thing of the past.

In the computer industry itself, employment is on the way down. According to the NEDO Sector Working Party, employment in computer manufacturing, after peaking at 53,000 in 1971 has fallen steadily to 43,000 in 1977. Similarly, employment in electronic components has fallen from 153,000 in 1974 to around 125,000. Just to maintain this level of employment, output will have to rise by at least 13% per year, so rapid are the increases in productivity.

No doubt new jobs will be created in these areas, but they will not compensate for jobs lost elsewhere in the economy, nor cope with the 'jobs gap' caused by school leavers. Much play has been made in the UK press of the report produced by US consultants Arthur D. Little which asserts that one million new jobs will be created by the electronics industry. A closer inspection reveals that of this million jobs, 600,000 will be in the US. That leaves only 400,000 in Western Europe, clearly not enough to solve the unemployment problem.

The service sector

The other area the government identifies as providing jobs is the service sector. Over the last thirty years the service sector has absorbed labour displaced by rationalisation from manufacturing industry and has provided the basis for the increase in women's employment. Jobs in the service sector have been the main area of expansion over the last ten years, while employment in manufacturing industry has consistently fallen.

But now the service sector itself is threatened by rationalisation. Like the rest of the economy, it has become heavily influenced by forces bringing about major improvements in labour productivity. This means that increases in output are not necessarily accompanied by increases in the labour input.

The service sector contains the following industries: gas, electricity and water; transport and communication; distributive trades; insurance, banking, and finance; professional and scientific services; miscellaneous services; and public administration and defence.

Both 'transport and communication' and 'gas electricity and water' are declining employers. Increases in labour productivity mean that though their output increased by a third to a half in the years 1966 to 1976, the number of people they employed fell 10%-20%. This trend can only continue.

'Distributive trades', which covers wholesaling and retail shops have also suffered a drop in employment while output has gone up. There are a number of reasons for this, including the trend towards supermarkets, and self service in the retail trade, and mergers and mechanical handling on the wholesale side. The introduction of computerised checkouts will cut employment even further, as stock control jobs vanish. Already an estimated 100,000 forecourt attendants in petrol stations have lost their jobs as computerised self-service petrol pumps have been introduced.

'Miscellaneous services' covers many activities, among them hotels and catering, hairdressing, launderettes, motor repairs and recreation. Labour saving developments have entered this industry too, with self-service in catering, automated launderettes, less frequent servicing of cars and the replacement rather than repair of defective parts in motor repair.

In the decade from 1966 to 1976, both output and employment rose marginally, and there seems little likelihood of a major growth in employment.

Bleak prospects

It is in the area of 'insurance, banking and finance' that we can expect the most dramatic reductions in employment as office automation, and word and data processing in particular, are rapidly introduced. The French government commissioned Nora Report predicts a 30% reduction of jobs in this area, and there can be no doubt that major rationalisations are in store here.

The remaining service industries, 'professional and scientific services', which mainly cover education and health, and 'public administration and defence' are not only subject to rationalisation in administration, but also to constraints on public spending. Given the government's commitment to keeping down public expenditure there can be no prospect of increased employment in this area. Indeed a memorandum from the Departments of Industry, Employment and Science states: 'We will be looking to the public sector to be in the lead in applying microelectronics themselves, wherever this is possible and economically desirable'.

A realistic assessment of employment prospects in the service sector shows that far from absorbing people whose jobs have been rationalised out of existence in other areas of the economy, the service sector itself is liable to shed jobs.

Other reports on the future of new technology and its implications hold out bleak prospects for employment in the economy as a whole. **A confidential report commissioned by the Department of Industry suggests that the introduction of new computing techniques is likely to raise unemployment in the UK to 2.5-million or 3.5million. Its authors Ian Barron, one of the founders of INMOS, and Ray Curnow of the Science Policy Research Unit (SPRU), state that it is hard to envisage new products, whether consumer or capital goods, which are of sufficient volume and value to absorb the displacement at least in the same time scale.**

Pre-chip car assembly.

Another report prepared for the TUC by the ASTMS research department predicts that there will be five million people unemployed by the mid-nineties even if the government takes every possible step to expand the economy.

Gilt investment

The government is choosing to ignore these reports. According to its scenario the new technology will increase productivity and lead to greater competitiveness in world markets and as a result new investment and consequently new jobs will flow into industry in Britain. What it ignores is both economic reality and recent history.

Britain is no longer a major industrial power, and to reverse the trends of the past 30 years would require implausible levels of investment. To be successful it would need an end to the protracted international recession and a reversal of company managements' investment criteria – neither of which is likely in the foreseeable future.

Investment in British industry has been inadequate for decades. Governments can give companies profits, but it can't make them invest those profits. Investment as a proportion of GNP is lower in Britain than in any of its competitors. What investment there is is used to increase the productivity of the existing industrial base. Apart from North Sea Oil there is no new area of significant industrial investment. As a result the growth of productive capacity is minimal, insufficient to compensate for job loss through rationalisation. The few jobs created in new industries will certainly not absorb those lost from declining traditional industries like shipbuilding and steel.

As for the profits generated by a major increase in productivity, through the application of the new technology, the events of the last decade illustrate quite clearly where they will go – into the finance sector. That means they will be placed in property, insurance, commodities, gilts and currency speculation, not into new industrial capacity.

The fact that the new technology is being introduced during a recession intensifies the tendency towards concentration of production in the hands of large companies. Because most of these large companies are multinational, there is also an increase in the internationalisation of production.

Its much easier to make profits in a growth market or industry, and to expand by take-over and rationalisation than by real new investment. For companies with large investments in Britain already, investing overseas spreads the risk as well as providing markets with greater fundamental growth prospects than in the UK.

As for the chances in Britain for economic growth and lower unemployment, a huge increase in industrial output would be needed. A forecast by the National Institute for Social and Economic Research estimated that for full employment to be restored, Britain's GNP would have to grow at 5% per year for five years. This implies an annual growth rate in manufacturing and exports of 8½% and 16% respectively. Even at the height of the post-war boom, these rates were never achieved.

Because Britain is a low wage area within the Common Market, US and Japanese companies worried about protectionist barriers will continue to locate plant here, but this will make little difference to the overall employment prospects.

The government's economic strategy is pitched to avoid these questions. It is aimed at boosting private profits at the expense of working people. The application of new technology with the sole aim of increasing profitability, regardless of the social costs, can only mean higher unemployment, weakened union organisation and the drastic de-skilling of the jobs that remain.

BATTLE FOR FLEET STREET

New computerised machinery is having a dramatic effect in the print industry.

'Newspapers are now small parts of empires that have big financial muscle. We are in a position to resist what we believe to be wrong and we shall do so.' (Duke Hussey – Chief Executive of Times Newspapers)

The dispute that led to the closure of Times Newspapers Ltd was in part about the introduction of new technology. Media coverage would have us believe that it was solely a 'luddite' reaction by autocratic print unions.

Pushing the issue of new technology into the forefront of the dispute in this way considerably weakened the union case, and accusations that workers are resisting progress will become increasingly familiar over the next decade. Rarely though is the arrival of new technology the key issue, and the newspaper industry is no exception. The bitter struggle now being waged in Fleet Street has its origins in developments quite remote from new technology.

Running newspapers has become big business. Today, following two decades of mergers, there are only nine major newspaper proprietors in Britain and they control nearly all national and provincial papers and magazines. They have controlling interests in other media, notably radio and television. The growth of this multimedia monopoly has led to a considerable concentration of control as well as a reduction in the range of publications and programmes.

But more significant than the growth of media monopolies is the absorption of these groups themselves into larger industrial enterprises. The Thompson organisation which owns the *Times*, Reed International which owns the *Mirror* and the *People* and Trafalgar House which has recently acquired the *Express* and launched the *Star*, are all broadly based multinational organisations of which the newspaper interests are a small albeit valuable part of the business.

Running newspapers is very profitable. The arrival of these conglomerates testifies to the fact that they believe even greater profits can be obtained by the rationalisation of production, but it will be carried out by managers who are part of companies with interests as varied as oil, property, paper, transport, travel and leisure. The continual comparison between the profitability of the newspaper side with that of these other investments will be the motivation for changes inside Fleet Street and the provincial newspapers.

This represents a considerable power shift inside the industry towards the employers. While changes take place the management anticipate some disruption of production, but losses on the newspaper side can be temporarily offset against other activities of the group.

Cost cutting

This makes it easier to introduce new machinery and new processes, with the consequent restructuring of the labour process and a reduction in the level of men to machinery. Rising costs of production and distribution but particularly the rocketing price of newsprint have reinforced this endeavour. In this they have been supported by the recent Royal Commission on the Press which recommended that new technology and loss of jobs were the only practical ways to cut costs in the industry. They estimated that the total investment involved in the national newspaper industry would amount to £20million for equipment plus £30million for pension and redundancy payments in return for the loss of up to 7,000 jobs, yielding savings of at least £20million a year (all at 1975 prices).

The history of Fleet Street industrial relations was formed in the days when cut-throat competition between newspapers greatly increased the bargaining power of the production unions. An edition lost through an industrial dispute was lost forever because of the nature of the industry and it was members of the print unions who had the industrial muscle. This is why wages in print and publishing are above the national average. Management now see a way of weakening this hold.

Union bashing

New technology has been introduced in nearly all areas of the printing industry. These innovations frequently involve the use of electronic techniques in place of mechanical equipment. In the composing room, high speed electronic typesetting, new techniques to prepare camera-ready copy and optical character recognition equipment and visual display units are among recent innovations having an impact on productivity and manpower. The computer can undertake several key composing room functions that were traditionally carried out by composing room craftsmen. Computerised typesetting by photographic process, another major innovation, is significantly faster than the conventional hot metal method.

This will also give the newspaper publishers the opportunity to attack trade union strength and organisation. They can attempt to cut jobs, lower the price of labour by reducing dependance on expensive skills, progressively remove from the workers control of the process and transfer it via machines to management. This would de-skill jobs in a series of areas which have been the traditional preserve of the craft unions, proud of their apprenticeship systems and skills.

Scab labour

In many US plants the International Typographical Union (ITU) has already been defeated. These defeats have weakened other unions and strengthened management overall. At one company, Media General in Richmond, Virginia, non-union labour was trained to operate new equipment in preparation for disputes with the print unions. When the union walked out the paper was produced by this non-union labour: few of the 180 who went on strike ever got their jobs back, and the paper has been non-union ever since.

In the UK, the Royal Commission on the Press estimated that 7,000 of a total of 20,000 print production workers, plus some casual workers, would be made redundant by the introduction of new technology. Already – in the *Daily Mirror* deal – one National Society of Operative Printers, Graphical and Media Personnel (NATSOPA) clerical chapel lost one-third of its jobs.

Fleet Street publishers are especially keen to get rid of the present payments system. Fundamental changes are being made to the system of bonus working and the London Scale of Prices established since 1785. The publishers are able to do so because the integrated systems which are now being introduced do not depend upon the actual effort put into the job by the

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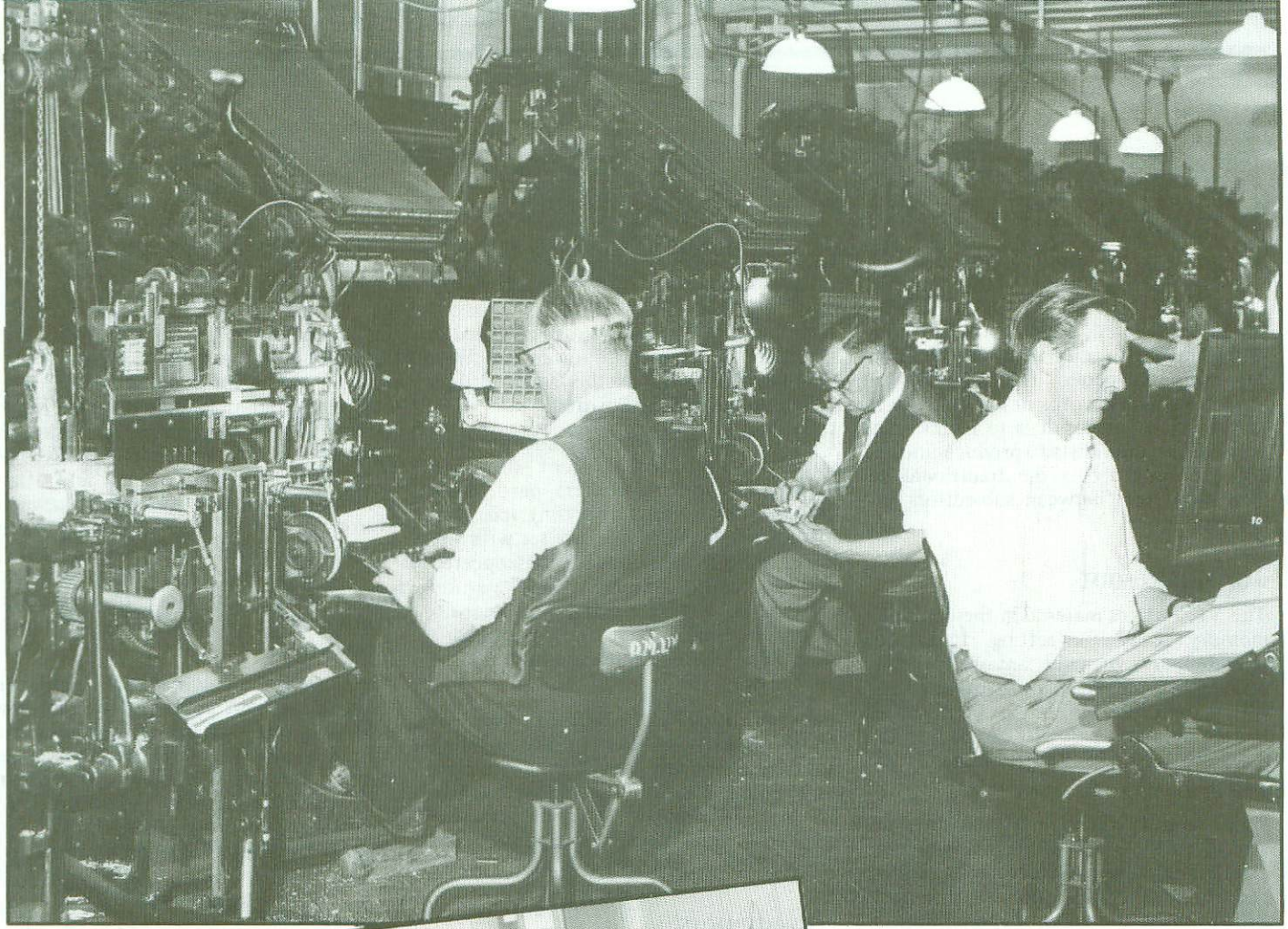

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Composing rooms – the old and the new.

operative. Rather they depend on the speed and output of the machine and computers involved.

Again, because of the rigid demarcation lines, it has been possible in the past to look at the composing room or its sub-sections as completely separate entities. This is not possible with an integrated system where the input comes from three or four sources. As a result the bonus position for the sections depends upon a number of external, non-controllable factors.

The new technology

The first change was the move towards printing newspapers and magazines by Web Offset, using photographic plate processes. Traditional rotary presses, with life left in them, can now be adapted to use photographic plates.

This paved the way for photo composition and computer typesetting. This left compositors, instead of using linotypes, keying words into a machine similar to a typewriter but linked to a computer. This justifies and stores the copy, and eventually switches it into a photosetter, the most modern of which can spew out 3,000 lines a minute, turning out type as artwork on photographic paper.

Now the question is direct input. Initially a system was evolved called 'optical character recognition', whereby the typed copy from the journalist was read by a special device which turned it into punched tape or put it on magnetic reels. But it is now easier to combine copy input and the setting process completely, so that the journalist can write copy directly into a computer terminal. Copy can then be edited while it is in the computer, before being processed for setting. This is the system that puts the writer in front of a video display terminal (VDT) that is connected directly to the setting process.

The VDT has a normal typewriter keyboard with extra keys to instruct the computer. With these keys, sentences or whole stories can be electronically

edited or deleted, leaving a clean copy in the memory rather than heavily amended copy on paper. The terminal can show how many words or lines have been written. The end result is to increase the pressure on journalists to produce finished copy, cutting across the traditional demarcation lines between sub-editors and reporters.

Job shake-out

The VDT places material in the computer memory ready for setting. It can be operated by virtually anyone – compositor, telesales staff, journalist or editor. But the material still has to be organised to fit the layout before it can be set. This is where the page view terminal (PVT) comes in.

Until recently technology had only advanced to the point where single column material could be presented on a terminal, except in the case of advertisements which can be shown on a special kind of multi-column VDT. Now, however, the layout of an entire page can be visualised on the PVT – the blocks of text, pictures and headlines can be manoeuvred round and adjusted until the page is put together to the satisfaction of the printer or page editor. Then, when instructed, the computer will set the copy to fit . . . and it can do so at a remote printing works, miles away.

Technology is now moving one stage further. A laser beam can be used to produce the finished printing plate without any artwork being needed whatsoever. And for smaller volumes, the computer can control a printing machine such as an ink-jet printer directly. Such systems are already available for producing office stationery and reports.

What we end up with then is a system which has the journalist, editor and designer on the one side and the printing machine minder on the other. Between them lies the computerised system that replaces the crafts and trades of centuries. No-one gains, except the owners.

Automation in the newspaper industry has developed further in the US than anywhere else. The US also leads in the supply and marketing of new equipment, and has been rapidly penetrating the European market. Application of the new techniques in Europe is most advanced in Scandinavia, closely followed by West Germany and the Netherlands. Britain is in an intermediary position.

Despite this, technological changes have already led to a significant shake-out among UK printing workers, particularly compositors. Computer setting has been introduced in individual houses with job losses of up to 50%. Jobs have disappeared through early retirement and natural wastage as well as redundancy. Recruitment has dried up and the compositor's traditional long apprenticeship is disappearing.

Between 1967 and 1976 a total of 63,000 jobs were lost in the printing industry, reducing the overall number to 196,000. There was a decline of nearly 5% in 1976 alone. Most of the jobs that were lost were skilled craftsmen's – the direct result of new technology.

Newspapers

Agreement has been reached at some newspapers for the introduction of new technology. The *Daily Mirror* is one instance – it has completed the changeover to photocomposition, with up to 50% staff cuts. Express Newspapers announced on 21.2.79 that it had successfully agreed with the National Graphical Association (NGA) on the introduction of electronic composition for the group's four newspapers. This is in sharp contrast to the *Times* where management is holding out for direct input by journalists and advertising staff. No other national UK newspaper is attempting to introduce this.

The *Daily Mail* has reached no decisions as yet. The *Mirror* has no plans for direct input. The *Guardian* is not saying what it intends to do at present. The *Daily Telegraph* is planning to introduce new technology as soon as agreement is reached with the unions. They envisage having direct input but at an unspecified future date. The *Financial Times* is waiting for the result of the *Times* dispute, but is believed to have something up its sleeve. Its European edition is printed in Frankfurt where new technology has already been introduced. The *Sun* will wait for the other papers and then follow suit.

The NGA is wholly opposed to direct input. The agreements it has reached with the *Daily Mirror,* the *Observer* and *Express* newspapers allow for computer setting and the introduction of the new technology but only under the exclusive control of NGA compositors. Express Newspapers have in fact argued that direct input involves a lengthy and often unsuccessful retraining of journalists and advertising staff and is simply not worth it. Why should they fight for it anyway, given that computer setting is the one thing that can do more to break the NGA's grip on the printing process than any other.

The *Times* is the only national newspaper which has sought to introduce the new technology through direct confrontation with the unions rather than a more gradual approach. The whole *Times* affair has been a classic example of the way that newspapers have changed over the years, becoming part of large corporations.

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Early in 1978 the Thompson Organisation (owners of the *Times* and *Sunday Times*) were considering investment policy. Revenue from their North Sea oil interests was likely to be large, and the question of where to invest it arose. Among the projects considered was expansion of the company's newspaper interests. The board, because of the effect stoppages were having on newspaper profitability, decided that the newspapers would have

to justify new investment just like any other part of the organisation. Hence the protracted struggle over direct input.

This is currently only operating at one newspaper in the UK, the *Nottingham Evening Post*. The managing director, Christopher Pole-Carew, claims that 85% of the copy is keyed directly into the computer by journalists and advertising clerks, and that the remaining 15%, mainly wire service copy, will soon flow straight in as well.

Last Post

Mr Pole-Carew does not like and does not recognise unions. A bitter strike in 1973, caused by management insistence on introducing plastic printing plates a matter of days before the NGA and Society of Lithographic Artists, Designers and Etchers (SLADE) were due to meet nationally to formulate policies on the new process, led to all five unions involved being locked out. Only about half of the 300 staff who went on strike were taken back.

The *Post* print room now has a staff of 17 compositors compared with 214 in 1967. The hot metal process was phased out immediately after the 1973 dispute.

The *Post*'s direct input system was developed jointly with the only British mainframe computer manufacturer, ICL. At no time, before or after installation, were the unions consulted on the implications for manning levels, job descriptions, working conditions or wages. At one stage the company was asked to consider using X-ray film badges in case there was a risk of radiation from the VDUs. Its response was that the screens were perfectly safe and did not represent a health hazard in any way.

Embarassment

There has been no monitoring of radiation, nor of the high pitched 'scream' from the VDUs which has also led to complaints from journalists. There has been no suggestion from management that staff should be given the opportunity of having eye tests before working with VDUs.

After the 1978 provincial journalists' strike 28 National Union of Journalists (NUJ) members at the *Post* were sacked. This has led to a major campaign for their reinstatement. A mass picket was organised on 3.3.79 when 400 pickets were confronted by a police presence of 600. Ten pickets were arrested. Local trade union branches are mobilising behind the campaign as a result. In addition to the NUJ's reinstatement campaign, the print unions together with the NUJ are involved in a battle to win proper recognition at the paper. The *Evening Post* is causing so much embarassment that it is even likely to be expelled from the Newspaper Society.

The NGA has consistently maintained that the input of typographical material is a composing room function, and that consideration of changes in demarcation lines can only be considered in the context of amalgamation of the unions in the print industry. Attacks have already been made on the NGA to persuade them to relinquish this control over input. In the US and Europe composing unions have been challenged on this issue and few of them have successfully resisted. The result has often been catastrophic in terms of lost jobs and employment opportunities.

All the unions in the UK industry have been involved in talks amongst themselves to work out a strategy to fight management attempts to cut jobs. Solidarity between print workers in the UK in the face of management attack has always been weakened by rifts between the print unions: relations between print workers and journalists in particular have often been poor.

Discussions are continuing between the NUJ, NATSOPA, SLADE, Society of Graphical and Allied Trades (SOGAT) and the NGA to try to agree guidelines for the introduction of new technology into the provincial daily newspaper industry. With such large possible job losses and changes in demarcation lines threatened, collective agreement among the unions and trade unionists concerned is essential.

Property millionaire Victor Matthews – the new face of Fleet Street.

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UNION RESPONSE

Are the Trade Unions defending their members?

The response of the Trade Union movement at a national level to the threat of their members' jobs being slashed is not encouraging. It can be summed up in a remark made by John Lloyd, the Education Officer of the EEPTU (the electricians' union). 'Our members will fight like hell to save those jobs at Edge Lane (the Plessey factory where 3,200 jobs are threatened). But we welcome new technology because we can't run away from it.'

This attitude of equivocation runs throughout the statements and policy guidelines issued by the national headquarters of the Trade Unions. Behind it lies the belief that the interest of British workers rests ultimately on the profitability and efficiency of British industry. A statement issued by the white collar union AUEW-TASS on the new technology can say 'technological advances will leave thousands of people redundant', and at the same time agree with Albert Booth, Secretary of State for Employment, that Britain has no alternative but to move as rapidly as possible to accept the new technology.

The TUC has welcomed the introduction of the new technology, and has praised the NEB action in creating a new microelectronic company INMOS. Its Economic Review for 1979 states that 'it must not be assumed that rapid technological change will necessarily happen in some automatic way in British industry. Indeed a great danger to the Trade Union movement is that it may not happen quickly enough'.

Most of the people who are going to be affected by the introduction of the new technology have only one defence. That is their trade union. Many unions, like the TGWU and the GMWU have no policy on new technology at all, only a general one against compulsory redundancies. Two of Britain's largest unions have no instructions to offer to their branches and nothing which their members at a local level will be able to use for support.

Even in unions where the attack on jobs is severe, and getting worse, national policy is not necessarily any clearer or more specific. The National Graphical Association (NGA) has a policy of no compulsory redundancies, a 35 hour week and all input into printing machines to be performed by NGA members. This is backed up with a policy of blacking new machinery. In its own terms the policy is successful, because work is being kept in the hands of the NGA, but the number of jobs is being drastically cut. There is no real strategy to save jobs by introducing work sharing, or opposing job loss by natural wastage and voluntary redundancy. At the time of the last pay negotiations the blacking of new machinery was lifted on the insistence of the management, who refused to negotiate while it remained in force. The situation at the moment therefore is that it is up to the individual chapels to negotiate agreements on the introduction of new technology.

Leaving it up to local branches is often a recipe for disaster, as people may be left isolated and defenceless. The introduction of word processors in Bradford Council is a good example of what can happen.

In Bradford in 1976 the local authority wanted to introduce word processors into the typing pool. The typists, all members of NALGO, opposed this. They did not get the support of their NALGO branch, mainly because one of the local officials was on the working party that recommended the introduction of the new technology. Eventually nine word processors were introduced and 22 jobs disappeared from the typing pool. Furthermore the agreements that had been negotiated with the typists were quickly broken by the Council, again with the tacit acceptance of the local branch.

Since this dispute NALGO has moved to try and prevent any repetition. It has instructed its branches to examine any proposals for the introduction of word processors (Circular LG/70/78) and ensure that neither pay nor jobs are lost. The branch circular points out, 'Even if guarantees of no redundancies are won jobs may be lost through natural wastage and non filling of vacant posts'. The circular also recommends seeking agreements on the operation of Visual Display Units, recommending a rest of 20 minutes every hour.

In Bradford, the Council has recently attempted to introduce word processing in other areas. In a reaction to the earlier debacle, the NALGO Branch called a meeting of all the typists and secretaries likely to be affected, about 200 in all, and they voted decisively to reject any further encroachment of new technology. The question is now being looked at by a joint working party of Union and Council representatives.

APEX, representing clerical and computer staff, has produced a lengthy report on word processing. 'No redundancy agreements simply redistribute unemployment to the potential job seeker just out of school – making him or her potentially more and more unemployable', the report says, pointing out that demands should be raised about retraining and expansion. Yet the report also seems to accept that there will be job loss, as it argues for changes in the Redundancy Payments Act to ensure that people are kept on a company's payroll until they find an alternative equally well paid job. Again, APEX follows the TUC line by supporting the policy of subsidising the microelectronics industry.

Many of the Union publications, particularly those of the TUC, talk of the benefits that new technology will bring, the prospect of increased leisure, the relief from drudgery and the overall benefits to the economy. Yet these are not the reasons that new technology is being introduced. Employers see its benefits in terms of increased productivity and profits. The Government sees the advantages in terms of the overall efficiency of the economy and its competitiveness with other economies.

It is all very well to decry the effects of unemployment, and call as AUEW-TASS does for social changes 'on a scale never known before'. But who is going to introduce them? The Government's view is that of the Think Tank, a complacent belief that the forces of the economy will solve any social dislocation in terms of redundancies and structural unemployment. And employers are not going to voluntarily reduce their opportunities for profit by willingly accepting safe working times on VDUs, work sharing and reductions in the working week. The Post Office, highly profitable as it is, has refused to accept the demand of the Post Office Engineering Union for a 35 hour week.

The new technology poses a threat at several levels. It affects the conditions

Keystone

Callaghan-Murray concordat.

and intensity of work. It reduces employment opportunities throughout the economy. And it undermines traditional union demarcation and organisation. Its introduction on the scale that the employers and government would wish will affect not only existing jobs but the jobs and career prospects of future generations.

It seems clear that the response of the trade unions should be to resist the introduction of the new technology until sufficient assurances have been won about jobs and unemployment, assurances which go beyond the existing patchwork policies of job creation schemes and subsidies. At a local level this opposition should be translated into written agreements covering all aspects of the introduction of the new technology. They should deal with work allocation and control, particularly the use of the machinery to monitor the work done by the operator – a new form of work measurement.

No job loss is obviously a basic demand. This must go further than opposition to compulsory redundancy. If jobs are going to be protected then there should be no reductions in the total workforce, and this means opposition to all forms of redundancy or natural wastage. The existing workforce and production should be taken as the starting point for agreements on a shorter working week, work sharing and safe working conditions.

The question of health and safety is in fact integral to the control of the new machinery. Both the National Union of Journalists and APEX have produced guidelines on the use of word processors and visual display units, to guard against deterioration in eyesight and increase in tension and stress. Arguing for such checks to be built into the working day is one way of establishing some control over the work process and of maintaining the quality of the working day. Yet this defence should go further. It should be carried to the question of the pace of work, whether in a typing pool, machine shop or assembly line, and should take up questions such as shift working and isolation.

Many of those affected by the new technology will not be in a trade union at all, or will not have a tradition of involvement. The way this can affect their ability to fight is shown by what happened at Bradford Council. That means that more recruitment of new members will be needed, particularly amongst office workers, and more argument for basic trade union principles. This highlights the need to establish the principle of shop stewards in all areas of the membership, so that every section can be represented.

There can be no question that the campaign to introduce the new technology is going to be stepped up in the coming months. For the trade union movement there will be no second chances.

PRESTEL

The computer in your living room.

One promised advantage of the new computing revolution is the availability of significant computer and storage capacity, not just for the business user, but because of its growing cheapness, for all of us.

There are three competing systems being prepared at the moment to tap a consumer and business market for information transmitted into the home or office. The idea is that information can be presented on a television screen. The viewer can select, using a push button unit rather like a pocket calculator, what sort of information is displayed. It would be possible, by pressing the right sequence of numbers, to receive on the screen a list of local restaurants, or the latest stock market prices.

The BBC and ITV both operate systems, called Ceefax and Oracle respectively. These can handle up to 800 pages of text. Both are being tested at the moment and manufacturers are introducing sets which are compatible with them. The Post Office service, known as Prestel, is already available in the London area and is very different from Ceefax and Oracle. It offers access via the telephone line to an unlimited data bank which could eventually extend to data banks in foreign countries.

Armchair

Potentially the Prestel system can develop into a computer in your living room. The Ceefax and Oracle systems however are not interactive with the user. They can provide lists of information but they are limited by lack of access and by scan time, i.e. it can take up to 25 seconds to access pages. Oracle is to some extent attempting to overcome its lack of competitiveness by toying with the idea of inserting a microprocessor in the terminal so that the user can work out simple equations like mortgage repayments tax rebates or social security benefits etc. The microprocessor would be reprogrammable and would be able to accept a range of programmes that would be broadcast by Oracle. This would certainly satisfy the demand for low level interactivity, but would not of course provide the real flexibility and total access that is promised with Prestel.

To quote a Post Office spokesman, 'With the next generation of technology local information centres will be able to extract information stored in remote centres and present it to the user with no discernable delay in access time. The capacity of Prestel will then run into several millions of pages and will become a vast storehouse of information and advice at the touch of a button.'

Popperfoto

The prospect is an exciting one. For the cost of the telephone rental and a colour TV, one can have access to thousands of pages of information, in your own home. Not only will it be possible to find out entertainment venues or railway timetables, it will be possible to have access to information from the Government Central Statistics Office, local business statistics and information on market trends, company analyses and so on.

This sort of information is available now of course, but usually in centralised libraries, or in the hands of separate magazines or publications. For the first time it could be available where you want it at phenomenally faster speed.

By placing information of all sorts directly in people's hands significant changes could occur in the way that people act and the sort of information they come to rely on. It is possible that the news in a form edited by newspapers and TV companies will be redundant. People will be able to access the figures that show for example how much living standards have declined, they will be able to access figures that show in reality how much money large companies have handed over to the exchequer in tax, and how much they have received in grants. The free access to information could be a great step in democratising society.

Yet the emphasis is on free, and that is precisely what Prestel is not. The way in which consumers will pay for the system is this. People who provide information to the system have to pay a rental fee to the Post Office. So, for example, somebody providing information on what holidays are available, such as a large travel organisation, pays a storage fee to the Post Office, at a cost of about £1000 a year and frame rental of £1 a year. There are other rental bands depending on how they are used, and how quickly the information is going to be changed.

Access

The information provider (IP) pays the Post Office, but the IP can also set a charge that the consumer has to pay each time the IP's page is viewed. This charge will be collected for the IP by the Post Office. The user of Prestel will be paying for the time he is using the telephone line, and paying for the information he uses, at a rate decided by the provider of that information. The maximum charge that can be levied is 50p a page. If an information provider wishes to charge even more for the information, if it is the result of special knowledge or research for example, or wants to restrict access, he can either ensure that the subscriber has to access a whole series of pages before reaching the desired one, or he can form a closed user group with limited access.

One researcher estimated that in just one week's casual, ordinary use of Prestel he spent over £15. Already the real cost of using the service to its realisable extent is going out of the average consumer's pocket. And as for using it to acquire information not readily available, the cost could be quite prohibitive. This is a serious qualification to the ideal of an informed society. The reality is that Prestel will merely reproduce the same stratified society as at present, with information going to those who can afford to buy it.

MADE IN HONG KONG...

The multinationals controlling the technology will opt for the high population, high unemployment areas of the Third World for assembly.

Over the last two decades electrical products have been revolutionised by the transistor. The effects since its development in the late 1950s can be seen everywhere. Transistor radios, much smaller, cheaper and more reliable than their valve predecessors, are common in every household. Television sets were also transistorised, and it is primarily because of this that the real price of a television set has fallen considerably since the late 1950s. And it was development of the transistor that laid the ground for development of micro-electronics and, ultimately, the microcomputer.

In other ways too the transistor was a very significant technological advance so far as the electrical industry was concerned. It removed many of the constraints that had previously existed on the location of plants manufacturing electrical equipment.

Products using valves were bulky and fragile, so it made no sense to ship them half way round the world. And because the major components, the valves, were expensive in themselves, the proportion of labour cost in the assembled product was comparatively low.

Trapped

The transistor changed all that. Radios and other such electrical products were now small and resilient enough to be transported long distances with minimal losses or cost. Transistor prices dropped so rapidly that the labour cost in assembly became a dominating factor. Japanese manufacturers in particular quickly learned that, by exploiting the new technology and their own low cost labour, they could undercut long established producers in the US and Europe. The latter either closed down, were bankrupted or followed suit and moved their production into even cheaper labour areas in the Far East. The development of the new technology has provided the impetus for relocating and rationalising practically an entire industrial sector.

The dislocation of both jobs and profits that resulted in the developed world was considerable, but it was ameliorated by the effects of the post-war boom. Despite this, there were calls for protective barriers against imports from low wage countries.

Today's new technology, the microcomputer, will have far wider reaching effects in many different sectors. The multinationals will again take the opportunity to shift production to low wage areas. This time, though, there will not be an economic boom to cushion the blow. And the inevitable calls for protectionism, as politicians and some union leaders and industrialists attempt to cover up the roots of the crisis, may have much more profound effects.

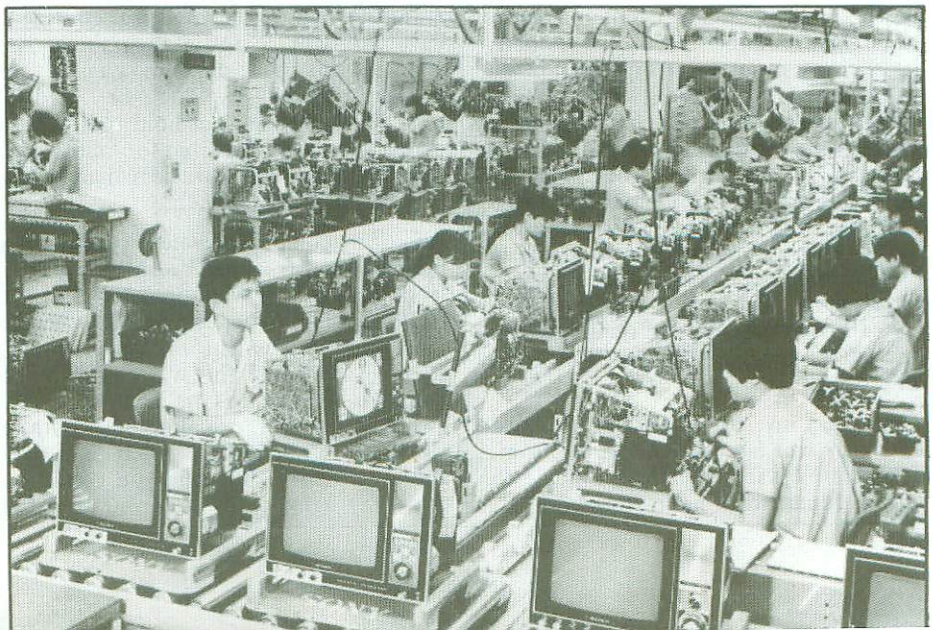
Low cost labour can be found in many Third World countries. What the multinationals look for to go with it is a government sympathetic to their needs, preferably right-wing, strongly centralised and with a harsh line on dissidence in the workforce. They also require basic infrastructure like power and communications.

What are the results of development and multinational investment? Economies that are still being bled dry by the developed world, but more tightly trapped between their domestic needs and the pressures of the international financial community in general and the IMF in particular. Repression of the workforce that becomes fiercer as the level of exploitation is raised. In some cases – for a tiny minority – the multinational brings better wages and conditions. But for the mass of workers, and particularly for the women and children among them, it offers appalling conditions, interminable hours worked at a frenetic rate and dismissal at the slightest sign of rebelliousness. Outside the factories are the queues of unemployed – slum dwellers drawn into the city by the promise of employment and the prospect of starvation in the undeveloped countryside – all the resources have gone into providing infrastructure for the multinationals and industrial 'development'.

Electronics manufacture in the Third World is still concentrated in South East Asia. The countries of the area most attractive to foreign investors can be divided into two groups. The first, with highly developed infrastructures but no great pool of unemployed, consists of South Korea, Hong Kong, Taiwan and Singapore. These have been the traditional sites for manufacturing and assembly investments for many years. The countries of the second group have large populations, high unemployment, but generally far less developed infrastructures. They are Indonesia, Thailand, Malaysia and the Philippines, whose economies have been based far more on agriculture and extractive industries such as mining and timber.

The sheer density of industrialisation and competition in the first group has created problems which make it very likely that future new investment will be attracted increasingly to the second group. The process of industrialisation which has already begun in the second group will be accelerated, along with the degree of

Electronic companies locate assembly in Far East low wage zones.



Keystone

external economic and political control. Investments in labour intensive, export oriented micro-electronics assembly plants will be a key factor in this process.

The new technology has already begun to make itself felt. In dozens of assembly plants in Hong Kong, Singapore, South Korea, Taiwan, Malaysia and the Philippines microchips imported from Japan and the USA are wired onto circuit boards by hand, mainly by young women. The assembled microprocessor is then re-exported to the country of the chip's origin.

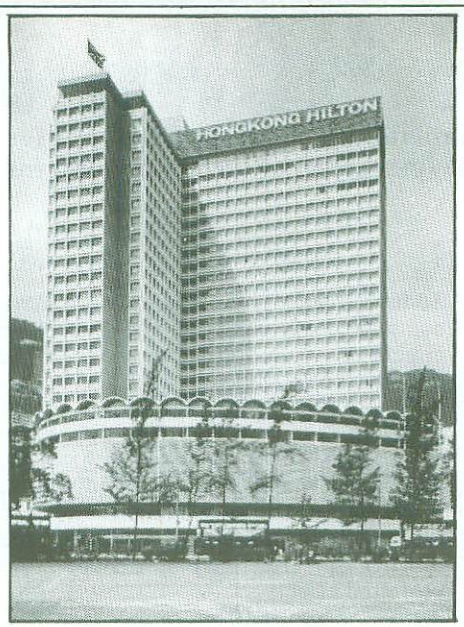
American semiconductor manufacturers are allowed to reimport goods into the USA under special tariff arrangements whereby they only pay import duties on the value added overseas. The lower the wages in the country of assembly, the lower the duty payable when the assembled parts are reimported. The Asian microprocessor assembly line worker receives about a third less than workers in other industries.

Singapore

'No sector has grown more rapidly than electronics, which now concentrates on micro-assembly and component manufacture. It employs about 18,000 workers and earns almost $1billion annually through exports. Major plants are operated by Texas Instruments, National Semiconductors, and Fairchild – all American concerns.' (*Financial Times* 22.11.78)

Singapore is a one-party state which has destroyed any independent power of the trade unions through restrictive legislation, structural reorganisation and mass arrests of leaders. The National Trades Union Congress has become an instrument with which government and management control the workforce. As a result the multinationals have been eager to invest, and they are further encouraged by incentives including five year tax holidays and an 'open door' policy on investments – foreign companies may own 100% of the equity of their Singapore operations and are allowed to repatriate all profits.

The largest investor is the USA, followed by Japan, which is also a major electronics assembler, Hitachi and Sanyo being the largest Japanese firms in Singapore. But

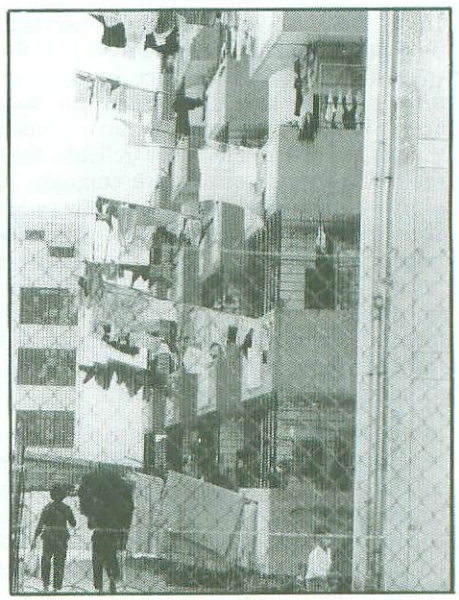


Keystone

it costs money to provide incentives and to maintain a sophisticated infrastructure. The export industries leave as little as possible in the Singapore economy, and the state is completely dependent on imports of energy and food. As a result Singapore's international debt is high and debt-servicing a constant problem. In 1977 the International Monetary Fund tried to reclassify it as a 'developed nation' which would have meant the loss of preferential treatment for Singapore manufactured goods exported to developed nations. The IMF was eventually dissuaded from the reclassification on the grounds that a major part of Singapore's GNP was both earned and spent by expatriates.

Electronics assembly in Singapore is a major employer of contract labour, mainly young Malaysian women. To keep wages down the country depends on a large immigrant workforce – some 120,000 – for the total local population only numbers 2.3 million. The immigrants are subject to severe restrictions. They enter the country on three year contracts, have no right to settle there, may not change jobs and are not eligible for public housing, welfare or medical services. They may not hold trade union office and can be deported for 'militancy'. Immigrant workers earn less than locals, and women less than men.

American companies were recently given permission to import women workers from Thailand. It was stipulated that the employers had to deposit $4,000 with the Singapore government for each worker, to be forfeited if she was found to be pregnant at one of the mandatory six monthly medical examinations. With a five year 'clean record' immigrants may apply to marry, but only on condition that they agree to be sterilized after the



Keystone

Hong Kong tenements

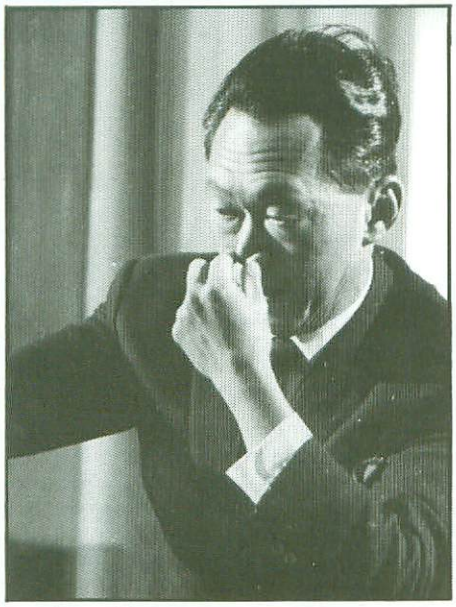
second child is born. Prime Minister Lee Kuan Yew justifies the policy on straight eugenics grounds reminiscent of Germany in the 1930s. A new generation of investment would require further immigration to Singapore. A recent Bank of America study estimates that an 11% growth rate would need a 20% increase in immigration.

Hong Kong

Hong Kong also uses migrant labour, from all over East Asia, and is currently negotiating with the Philippines government for the import of Filipino labour. Like Singapore and Taiwan it is a densely populated island. Hong Kong has the highest paid micro-electronics assemblers in South East Asia. High land and property costs as well as a labour scarcity have contributed to a slowing down in the last two or three years in new high technology investment.

The USA is the largest foreign investor in manufacturing industry with well over 50% of the total. Japan, the next largest investor, has about 14%. The textile, electronics and toy industries which dominate the manufacturing sector have been built and sustained on the underpaid, overworked labour of women, immigrants and even children. 400 factory owners were convicted in 1977 for using under-

Keystone



Lee Kuan Yew

age labour, and they probably only represent the tip of the iceberg. Yet a member of the Hong Kong legislative Council recently complained that if free education were to be extended to all fourth and fifth year pupils (instead of only 50% as at present) more would go on to full time education instead of entering employment, 'a dangerous situation detrimental to industry'.

Hong Kong's textile industry, in fierce competition with other South East Asian countries such as South Korea and Taiwan, and hit by protectionism in the EEC and in the USA, is past its peak, certainly as far as new investment is concerned. Electronics is the leading light industry, and exports grew 20% in 1977. Telecommunications equipment is the main component of the industry, followed by transistor radios.

In electronics there has been more growth in productivity than in new investment in the last couple of years, and some sectors such as digital calculators and Citizens Band radios have begun to decline on a saturated market. Small, crowded, and increasingly expensive, Hong Kong is not the ideal new site for large new investments in manufacturing. It does, however, have one unique characteristic which could make it very important in the future growth of the industry, and that is its relationship with the People's Republic of China.

For years Hong Kong has acted as the channel through which foreign currencies entered China. As China's new concentration on building trade and investment links with the West develops, Hong Kong's role as a financial crossroads grows too. It is already the major centre for offshore corporate loans in the area, and there has been a swift build up of foreign bank branches over the last year or so, no doubt with an eye to the possibilities of the Chinese connection.

A *Financial Times* survey in April 1978 reported that China has shown an interest in establishing subcontracting arrangements between mainland factories and Hong Kong textile and electronics companies. The idea is that China should assemble from designs and components supplied by Hong Kong, and then ship the products back to be marketed as from Hong Kong. The possibilities for Chinese 'export processing' plants are limitless. There is a stupendously large supply of very cheap and well disciplined labour, with no trade unions as such, and a powerful, secure regime. Terms are excellent – the Chinese government pays 70% of plant capital costs, and guarantees the right to import all components from abroad, and there is a minimum 20% profit rate.

A number of Hong Kong electronics firms are already making components as well as assembling them, and so are in a good position to take advantage of the Chinese initiatives. Foreign investors would no doubt love to get in on the deal if at all possible. Fairchild Semiconductor (Hong Kong) Ltd is embarking on a rapid expansion which includes the local production of semiconductor discs previously made solely in the USA by the firm's parent. It is conceivable that Hong Kong will provide the manufacturers of the new technology with access to the biggest low cost labour market of them all.

Taiwan

Electronics, Taiwan's main growth industry, was set up by US and Japanese manufacturers seeking low wage areas in the 1960s. Today a third of its foreign investment is American, 16% Japanese, and 30% Overseas Chinese (non-Taiwan residents). A predominantly agricultural society less than 30 years ago Taiwan has turned into a manufacturing and assembly subsidiary of the USA and Japan.

There are three Export Processing Zones, and foreign investors get all the usual incentives – free repatriation of profits, tax holidays, duty exemptions etc. Yet 1976 bank analyses of Taiwan's investment climate complained of low profit margins, rising material and labour costs, and labour shortages. Despite one of the highest population densities in the world, Taiwan is becoming less able to attract high levels of foreign investment with the promise of guaranteed cheap labour.

There has been a slow-down in growth, protectionism in the export markets, a shortage of cheap labour and an increase in foreign debt incurred as the Taiwan government attempts to stimulate growth by pouring money into infrastructure services. Rockwell has closed down its colour television plant and Taiwan's biggest electronics application manufacturer, the Tatung Company, is considering setting up manufacturing operations in the USA to avoid tariff restrictions.

South Korea

South Korea too has a grave shortage of labour. In this case it is skilled labour that is in short supply. The result is that certain skilled wages have rocketed. A scramble for housing and goods has increased inflation, and the low paid workers, despite savage reprisals, have been forced to rebel in order to survive. The gap between low and high paid is extreme. Top technicians' pay is as high as £680 per month, while at the other end of the scale twelve and thirteen year old girls work up to 18 hours a day, seven days a week, for as little as £12 a month.

Despite vicious attacks by police, the infamous Korean CIA, and government-controlled union thugs, women textile workers have continued to campaign for proper union representation. There have also been seven counter-coups against the Park regime. The growth of such popular frustration and organised opposition must tend to deter prospective long-term investment.

Foreign investment is dominated by the Japanese and concentrated in the Free Export Zones. Domestic manufacturers such as Samsung Electronics, the largest Korean electronics firm, have based their development on the Japanese models, borrowing overseas technology through

licenses and joint ventures, drawing heavily on government support, and systematically using large numbers of subcontractors with very low paid, ununionised workforces. Samsung has a number of joint ventures with Japanese and American electronic firms, including one with Circuits International of California to produce large scale integrated circuits and other sophisticated silicon wafer devices.

The most likely development in South Korea's electronics industry is that foreign investors will continue to produce and assemble the old generation of consumer goods in the Free Trade Zones. At the same time the domestic manufacturers will become competitors and partners with Japanese and American firms for cheaper labour sites for the new technology in the less developed states of the region. The development of microtechnology in electronics is producing a new generation of investment. In the 'developed' countries, as we demonstrate elsewhere in this report, the effect will be to increase unemployment and productivity simultaneously. Where labour intensivity is needed, either in the electronics industry itself or in applications to other industries where large scale assembly is called for, operations will be sited wherever strong authoritarian regimes can guarantee cheap labour, serviceable infrastructuress and an attractive package of financial incentives. South East Asia is a prime area for such siting, and the microelectronics industry will continue to fuel the economic colonisation of the area. The emphasis, however, will move away from the four states where the first generation of electronic products were concentrated, and we can now expect far more attention to be focused on the poor cousins of South East Asia – Indonesia, Thailand, Malaysia and the Philippines, as well as on China via Hong Kong.

Indonesia

With a population of 143 million Indonesia is the largest country in South East Asia. In 1977/78 unemployment rose to 25% of the workforce and the total of unemployed and underemployed could be as high as 40%. Despite enormous resources of natural wealth, including oil, Indonesia has large foreign debts (which rose to $13billion in 1977/78) and a dangerously high ratio of debt service to export earnings. Unions hardly exist, and strikes are illegal. Wages are so low that they are often partly paid in food. Fairchild, which employs 3,000 Indonesians, turns away 500 job applicants *every day*. Manufacturing occupies only 8% of the workforce and provides only 2% of exports. 60% of the workforce are employed on the land.

The regime, under General Suharto, is repressive in the extreme. To encourage sluggish investment the government has recently simplified investment decision-making machinery, begun plans for a tax free industrial estate, extended time limits for local component incorporation, and devalued the currency by a hefty 33.6% in order to boost exports and maintain international reserves. The new Suharto cabinet has taken half its members from the military leadership. Gratified by such progress the US Department of Commerce felt able to report towards the end of 1978 that the outlook for Indonesia was now favourable, sentiments echoed by several American bankers visiting the country.

Thailand

Labour intensive electronics assembly in Thailand was pioneered by National Semiconductor in 1973. The company now has plans for one of the largest consolidated assembly operations in the world, with 5,000 employees. Even by regional standards wages are low. In 1978 there was a 25% rise in the minimum daily wage to 35 baht – about $1.75. The rapidly rising population, already 44 million strong, means that half a million new jobs a year are needed. 75% of the workforce is in agriculture, and only 8% in manufacturing, though this sector provides 20% of GDP.

In October 1977 Thailand's leadership passed from a right-wing civilian administration to military rule. The government is eager to shift from exports of agricultural goods and minerals to exporting finished and semi-finished goods and is offering tax exemptions and reductions as incentives for export-oriented industries. With newly discovered natural gas and a low debt-service ratio Thailand can afford to improve the infrastructure to attract new investors.

Malaysia

The Malaysian government has also been trying to restimulate private investment by amending its Industrial Coordination Act. This contained a licensing scheme for manufacturing activity as well as encouraging the employment of Malay partners and workers. There is racial discrimination against Chinese (37% of a population of 13 million) and Indians (9%) in education as well as in business.

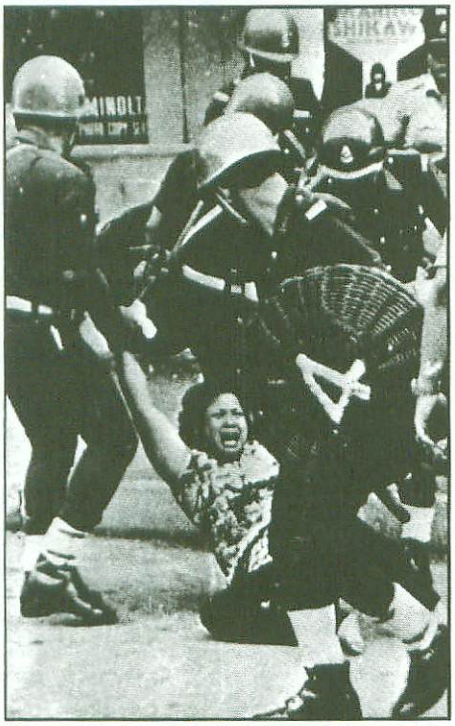
The economy is not growing fast enough to generate enough jobs for school leavers. Wages are low, and unemployment is around 6.6% in the 15-25 age group. Official literature informs would-be investors that they can hire 'educated female factory labour' for as little as 60p per day.

50% of Malaysia's 4.2 million working population work in the primary sector (including forestry and fishing) which accounts for about 29% of GDP as against manufacturing's 16%. Some of the infrastructure for export manufacturing is already in place. The first Free Trade Zone was established in Penang in 1972 and there are now half a dozen, and over half of the factories in them are electronics operations.

The Philippines

With a military dictatorship, 45 million population, 8% unemployment, and a minimum daily wage rate of about $1.50 to be raised by only 15 cents a year over the next three years, the Philippines typify all that is most attractive to the electronics assembly investor. There is sufficient wealth in the economy in the form of raw materials to underwrite an expansion of infrastructure spending, though foreign indebtedness is already high. The more President Marcos, dictator for some sixteen years, gets into debt, the more the USA and Japan, the major investors, can mould economic policy to their own convenience.

Since 1972, when martial law was declared, the business community has prospered. The population grows by almost 3% per annum, and the labour



Answering wage demands in Malaysia.

force is rising faster than jobs are created. There is a large Export Processing Zone at Bataan. 90% of the electronics industry in the Philippines is on a 'consignment basis'. US and Japanese firms import semi-processed goods to be finished for onward shipping to their own markets, thereby adding hardly anything to the Philippines' balance of payments.

Indonesia, Thailand, Malaysia and the Philippines have been on the brink of a new wave of 'development' for some time. With the last generation of investments already established in the advanced industrialised states of South East Asia, the low wage advantage of the less developed states was not sufficient to offset the superior infrastructures of the developed nations. With micro-electronics providing a need for a new generation of investment, not just in electronics assembly but also, eventually, in industries and products transformed by microprocessor application, there is little doubt that the Americans, the Japanese and other nations controlling the technology will opt for the high population, high unemployment areas.

The social and economic structures of those countries will be transformed, uprooting the rural populations, increasing their dependence on imported essentials such as food, and hardening even further the stranglehold of the violent and authoritarian regimes which rule them. The new technology can be seen as the Trojan horse ushering in the next several decades of intensified exploitation in the region.

Facts of Life

A 34-year old woman, widow for the past two years, with four children, Assha is now working in a Free Trade Zone in Penang, Malaysia. An asthmatic patient, she sought welfare from the government soon after her husband passed away. However, after seeking help, the welfare office only told her that she is "still young and strong enough to be able to work." Her income is small – "what I get is just enough to pay for food and rent" – (rent alone comes to M$20 per month for their small one-room apartment which is only three square meters wide with neither toilet nor kitchen). She received nine years of schooling. The interview was conducted in May, 1976.

Q: When did you start to work?
A: November, 1973. I was working in the microsystems company as a wire bonder in semi-conductor work. The factory was owned by a Canadian. I was working there as a wire bonder for about a year. Then the company closed down and they started to retrench workers. They asked my age which was already over-aged. If they retrenched me, I wouldn't have another chance to go to another factory to work. But I had a good record (no mistakes). They picked out the good ones and pushed to another factory – it's also a Canadian factory but managed by another person.
Q: This is where you are working now?
A: Yes, it's also microsystems, but called telecommunication.
Q: What kind of work do you do?
A: Assembly work. That's a lot of work but I'm doing the final section. We pour the epoxy (organic flux) – which has a very bad smell – to cover up the terminals. The products are exported to Canada.
Q: Please tell me about your wage.
A: Formerly, I got M$3.00 (US$1.20) and 85 cents (US$0.34) of Cola daily. They cut off M$.70 for bus fare from our pay.
Q: If you should take a day off, they won't pay?
A: They don't pay. Suppose we take off on a working day, we get a Medical Certificate (MC) from the hospital. They pay us the pay, but they don't pay us the Cola. But they also cut our bus fare, whether or not we go to work.
Q: Now you work six days a week?
A: Sometimes five days a week and sometimes six days a week.
Q: So it's actually 23 or 25 days a month.
A: Roundabout, yes. Sometimes they give us overtime. If it's on a public holiday formerly they paid us two days' pay. Now they're paying three days' pay on a public holiday. And on Sundays, they pay double.
Q: How much do you get now?
A: I'm getting M$3.70 and M$.85 for Cola. (Cola is for all expenses.)
Q: How much, on the average, do male workers get?
A: They got M$6.50 a day.
Q: What kind of job are they doing?
A: Machinery work. Changing parts, air-conditioning, plumbing . . .
Q: Are they skilled workers?
A: Unskilled. They cut M$4.00 from every paycheck for the Employees Provident Fund (EPF). We get paid twice a month (every 14 days). We are not paid for anything like insurance. Formerly, they cut our insurance, but now they don't. Microscope work affects the eyes, so they used to give us insurance. Now they say that the work does not affect the eyes and they don't give any insurance policy.
Q: How often is your wage raised?
A: Every six months – 30 cents. But we must go over a target. If we go over our target, then we'll get something like 60 cents or 30 cents extra.
Q: And you work in two shifts?
A: Yes. Morning shift is from 7.00am to 3.00pm. The evening shift is from 3.00pm to 11.00pm. We have two weeks shift in the morning and two weeks shift in the afternoon. After every two weeks, it is changed. But at several other factories within FTZ, like Motorola and Intel, workers work in three shifts; from 2.00pm to 10.00pm, from 10.00pm to 6.00am and from 6.00am to 2.00pm.
Q: Does the factory bus come and pick you up?
A: Yes, we go to the bus stop and only one bus is given. Suppose we miss our bus, we have to go on our own.
Q: How long does it take from your home to the factory?
A: One hour. The distance from the fac-

tory to my house is about 10-12 miles.
Q: How many workers are there in your factory?
A: 60 workers in the first shift and 60 workers in the afternoon shift. These 120 exclude technicians and supervisors.
Q: Mostly women workers?
A: Yes – and young. The age is limited to 16-24.
Q: When the girls reach 24, do they have to retire?
A: No. But if they have any mistakes, not liable to work, they'll retrench us.
Q: Are all the supervisors Malays or . . .?
A: Malays, mostly men. Maintenance are Malays, also men. Our prime supervisor is Eurasian.
Q: Could you tell something about your working conditions?
A: The name of one mixture is called epoxy (organic flux) and we have another liquid which is anti-foam. If you don't pour anti-foam in it, bubbles will come out and the project will be rejected. We mix both by two to one, then put it into a syringe – like the injection syringe and pour the mixture inside the holes. It takes eight hours to dry up one side. Then, we pour in the other side.
Q: Do many workers get sick?
A: Yes, there are those who are allergic to the liquid – they get skin diseases. Some have swollen eyes.
Q: Do you have any allergies or skin troubles?
A: No, but two girls I am working with in the afternoon shift, they have the allergy. The liquid when we soak our hands it is very dangerous, and also we use acetone, 10 per cent acid mixed. Very strong smell. Wire bonding is very bad for the eyes. If you do it very long, you'll spoil your eyes. My eyesight is affected a little.
Q: It hurts?
A: Not that it hurts. After some time we can't see very clearly, it's blurred. We'll be looking into the scope for 7.2 hours. We have the gold wire, very thin, very fine – just like our hair.
Q: Is there a clinic in your factory?
A: No, we don't have a clinic. When we are sick, we'll see the manager and then she'll give us a medical sheet. We go to one clinic. If she finds out we are really sick, then she'll give us a medical certificate (MC), and we don't go to work the following day. If she finds us not very sick, she'll ask us to go the next day. We don't pay for the doctor.
Q: Do you have to go to that certain doctor – the company's doctor?
A: Suppose we don't like to go to the company's doctor, we can go to the general hospital.
Q: Have you yourself been to the doctor many times?
A: No, so far, I've not been to the doctor many times. Then there's a rule. We cannot take more than 14 days MC. But after 14 days, they won't be giving us any pay for that MC. [*Assha is very thin woman, probably weighs only 35 kilograms, and looks so delicate.*]
Q: How is the workers situation?
A: Dissatisfied. They don't like it because they don't get enough. Some are not actually given an increase every six months, and the work is hard. It'll just drag on nine months, sometimes even one year, they'll increase only once.

Micro assembly in the Philippines.

Q: So many workers just quit the job, and new girls keep coming?
A: Some, they stick to the work, some, they find the work hard and the pay is low, they just quit.
Q: Do you have trade unions?
A: No, we don't have any unions and we are not allowed to join any unions. If they find out that we join unions, we'll be retrenched.
Q: Do you think a trade union is needed for the workers?
A: Yes, definitely. It can fight for us. We need a union.
Q: Has your section ever had conflicts with the company?
A: Formerly, they had a strike, but it was only once. They didn't give us our allowance of 85 cents – so we went on strike. Then the company agreed to pay.
Q: Does the company provide you with meals?
A: No, we take our own lunch. They only give us one piece of fruit everyday during our lunchtime. But at lunch, we can buy food at the canteen.
Q: Are there places for workers to have lunch?
A: Yes, we have benches and tables and the prices are very reasonable.
Q: How about breaks?
A: In the morning shift we have 9.00-9:10 coffee/tea break. Then we have our lunch at 11:00-11:30. Then another break at 1:00-1:10.
Q: How about air conditioning?
A: Fully air-conditioned. Only the workers are in the air-conditioned part. When we go for a break, it's out of the air-conditioned place . . . it's outside the plant.
Q: How about recreation?
A: We have games – netball, badminton and the male workers have football.
Q: Do you talk much with other workers?
A: During working hours we can't talk.
Q: In your workshop, are nationalities mixed?
A: Yes, Indians, Malays, Chinese, Eurasians.
Q: Are there any racial tensions?
A: No, I don't find any.
Q: How about supervisors?
A: Supervisors are mostly Chinese and Malays – there's only one Indian supervisor. He's quite friendly with us. During working hours, he has joke with us. Our production manager is Canadian. He sticks to his office and pays no attention to us.
Q: How many factories are there in the Bayan Lepas FTZ?
A: Zone one there are about 20 factories. Zone 2 about 11 factories. There are about 30 factories altogether, but some factories are closed down due to the product market.
Q: So these workers who used to work at those factories lost their jobs?
A: Yes, mostly. For some workers it is very hard to find another job.

STATE PROMOTION

Governments throughout the industrialised world are handing out money and contracts in attempts to foster the growth of their own national electronics industries.

Intel's founder, Bob Noyce, admits 'I'm scared of the Japanese because they have the unfair advantage of having their government on their side' (*Fortune* 27.2.78). The fear may be unfounded, but it does highlight the importance of government 'assistance' in the development of the electronics industry. Multi-billion dollar contracts handed out by the US government under Space and Defence Programmes gave companies like IBM, Honeywell and Burroughs the technological lead they have today. This support still continues.

Japanese government assistance is more direct, with corporations and state agencies openly working in partnership. In the 1950s a national plan was formulated which concentrated on a narrow range of export industries and encouraged the application of highly advanced and innovative technology to production engineering and product design. This formula was highly successful, and in the late 1960s the Japanese government began pouring money into integrated circuit technology, amounting to some £500million to date.

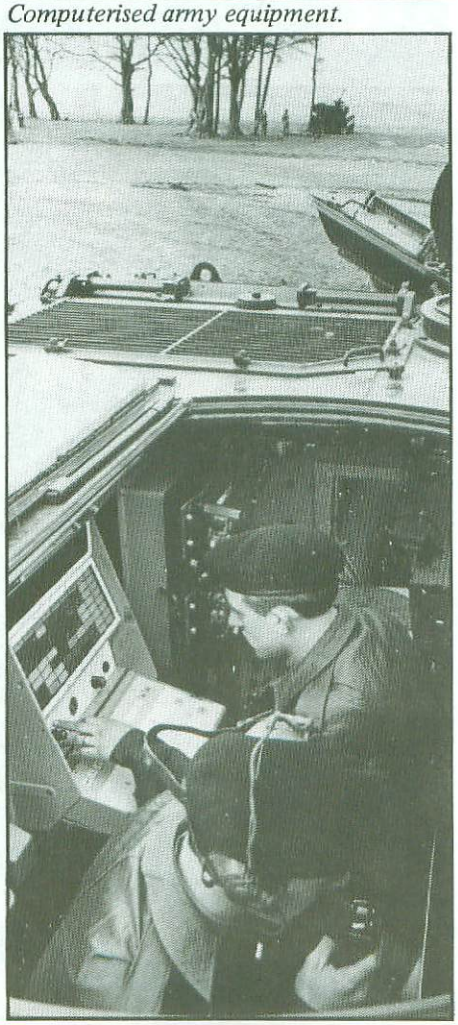
The Ministry of International Trade and Industry spearheaded the research effort into chip production 'which has raised Japanese technology onto roughly equal footing with the industry leader' (Hoare Govett Ltd, Stockbrokers). At the same time the indigenous computer industry – Fujitsu, Hitachi, Nippon, Toshiba, Mitsubishi and Oki – was rationalised by the Ministry into two groups, one to develop IBM-compatible systems and the other to produce an independent system.

These developments have not been lost on the US industry. 'Their intent is quite clear. They are out to slit our throats and we'd better recognise that and do something about it', says Intel's Bob Noyce. And if, as *Fortune* (27.2.78) claims, the Japanese intend to 'leapfrog the US in semiconductor technology and thus gain dominance in the world computer and electronics market', the US industry is going to be looking for more than preferential treatment by the US government. They, alongside the car manufacturers, are actively calling for protection of the home market from Japanese imports.

'When the US and Japanese giants join battle in earnest any European contestants will need sharp footwork to avoid being crushed. For whatever the outcome intense competition for the volume markets is likely to result.' (*Financial Times* 19.9.78) As a belated response European governments are planning to spend a billion dollars over the next five years in an attempt to catch up. The chances of success are slim in the face of the Japanese and US corporations' dominance and the huge subsidies they receive. The result will be increasing calls for protection of the European markets.

For the time being each European government is working out its own separate strategy. The French government appears to recognise that an independent effort to catch up with the Americans would be hopeless – it used government subsidies to tempt Motorola into a joint venture with Thomson-CSF, the largest French electronics group.

Computerised army equipment.



Keystone

This type of joint transatlantic venture is only one of a number of options open to European governments anxious to develop a home based industry. A less ambitious way is to subsidise local firms and encourage them to carve out specialised corners of the market. Much of the UK's £70million support fund will be used in this manner, as will part of the £270million put aside by the French ministry of Industry to help local industry over the next five years. In West Germany, state subsidies are being used to give Siemens a capability in advanced chips and to support its purchase of know-how from Advanced Micro Devices and Zilog in the US.

The riskiest approach is that of the National Enterprise Board (NEB) in the UK. It is spending £50million to set up INMOS, a completely new electronics company, which aims to compete head on with the Americans and Japanese from a standing start.

The intention behind these different strategies is not only to encourage home electronics companies but also to open up the economy to the new technology in order to raise productivity. Most governments are keeping quiet about the implications of the strategy. President D'Estaing of France though has publicly admitted that jobs will be lost everywhere except in the electronics industry itself. The Nora report, commissioned by his government, forecasts large scale unemployment and predicts that the Seventh Five Year Plan will be rendered ineffective.

There is another side to government attempts to foster the growth of 'their own' national electronics industries. If domestic firms prove to be less than competitive, then the pressure for protectionist measures – tariff barriers, import controls and so on – is bound to grow. The dangers of protectionism are great: the political corollary is an upsurge of nationalism and racism. The threat of Common Market barriers against electronic imports from South East Asia, together with a well orchestrated chauvinist campaign, is real indeed.

A BETTER TOMORROW?

It is vital that new technology is not introduced without safeguards. The development of microelectronics could provide immeasurable improvements to the quality of life. But, unless jobs and work practices are protected, it will only mean poverty, unemployment and the degradation of working conditions.

The microprocessor is a cheap, mass produced component that embodies considerable responsive power. It can be programmed to do practically anything from playing games to controlling car engines, from running machines on a production line to ploughing whole fields unattended. When new technology is used solely to maximise profits, it means a direct trade-off of jobs for profits.

It may be because products incorporating it need less labour. It may be because working methods using it are that much more productive. It may be because whole product ranges become obsolete. The equation works out the same in practically every case: use the new technology, save labour. It is an equation that few employers will ignore, in a world suffering protracted recession, long term declining profitability, and political and economic uncertainty.

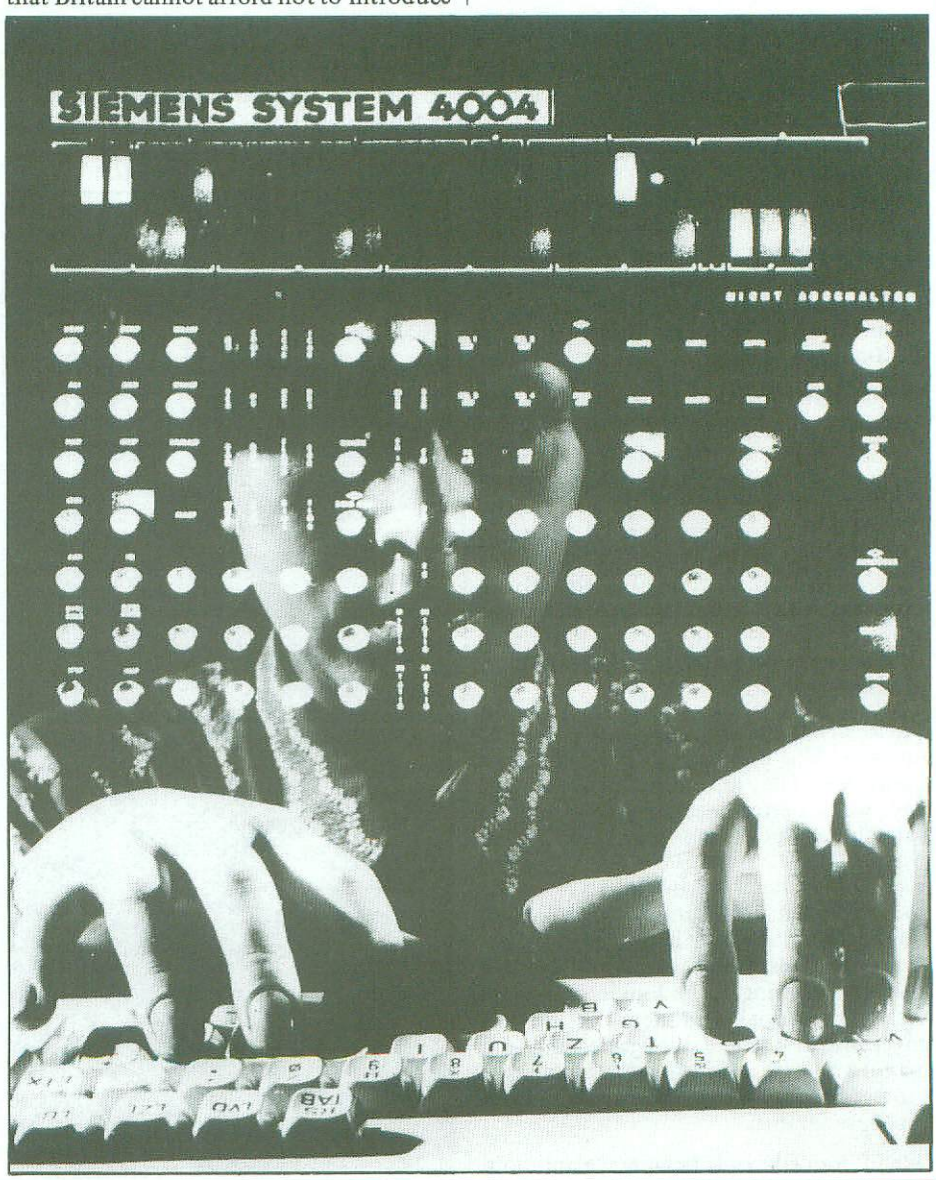
Unlike previous periods of rapid technological innovation, every sector of the economy is being affected at once. There is job loss everywhere. Workers whose jobs are destroyed by rationalisation, and those entering the labour force for the first time, have nowhere to go. No sector of the economy is expanding its workforce to absorb them.

For those with jobs, conditions at work are going to be far harder. The limited powers to determine the organisation and pace of work that many workers have managed to establish are under threat. New technology brings de-skilling, fragmentation and increased monitoring of the work process. This means managements can exercise much tighter control over individual workers. Wages and conditions which have been defended by strong union organisation are now under attack as whole crafts are destroyed and demarcation lines rendered meaningless.

On a world scale, the cheapness of the new equipment together with the fact that it can be operated by relatively unskilled labour, opens the door for companies to relocate their production. Cheap labour and a well disciplined workforce are the criteria they use. The trend is moving away from bringing immigrant workers to jobs – rather jobs are being sited in the Third World. The danger is that cheap imports from low wage countries will be blamed for Britain's economic ills, with the political corollary of nationalism and racism.

The government and the employers argue that Britain cannot afford not to introduce the new technology. Without it, declining competitiveness will mean even greater poverty and unemployment in the long term. What kind of society do we live in, that offers only these alternatives? New technology and resulting mass unemployment, or an inevitable decline into poverty?

The question has to be: who controls the new technology? There is everything at stake. Working people must ensure that they enjoy the benefits of the miracles of 20th Century science.



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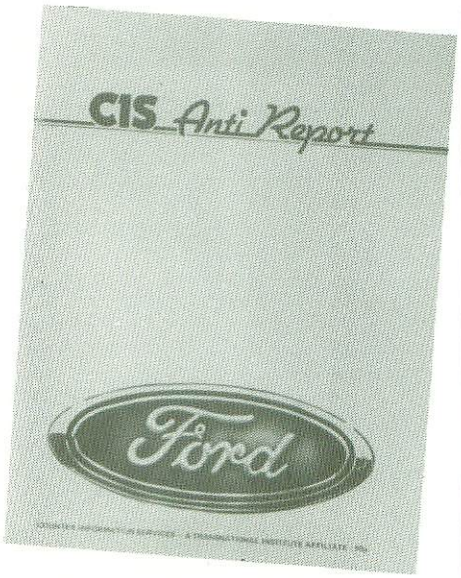

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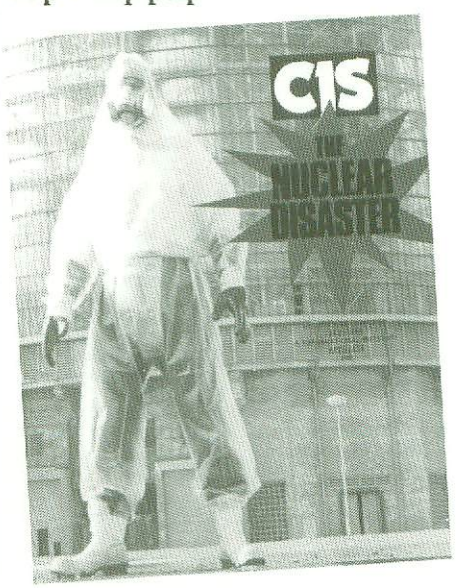

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