The Political Economy of Computing in Australia

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This paper is an attempt to analyse the workings of the international computing industry and its effect upon Australia so that we may better understand the likely impact of new technology, such as the silicon chip, and start the construction of an alternative strategy in this important area.

To this end the paper is organised into the following five sections:

(1) describes the size and structure of the computing industry, the major corporations involved and the international trade in computers.

(2) explains the main reasons for this present structure and how the corporations operate in order to maintain and extend their market position.

(3) describes the undesirable effects these operations have upon the Australian economy and our social and political institutions.

(4) assesses the likely changes that the new technologies, such as microprocessors and word processing machines, are likely to have on the future power and activities of these corporations.

(5) concludes with some comments on an alternative strategy towards computerised technology and suggests some important areas for future research.

Terminology is always a problem. Without claiming any universal validity, I will try to be consistent throughout this paper in my usage of the following terms:

(a) By 'computer', I shall mean the machinery itself. This will include the central processor and all peripheral devices such as printers, card readers, visual display units, disk drives, tape drives, etc. This is also sometimes referred to as 'hardware'.

(b) By 'computing', I shall include both the computer and all services associated with it. These services will include the programming languages, applications packages and specially written programmes (sometimes collectively referred to as 'software') and such items as technical manuals, training and education, maintenance of equipment, provision of back-up facilities, the supply of paper, reels of tape, etc. and even general advice given about computerisation.

(c) By 'computerisation', I shall mean the process whereby a computer is introduced into an existing work situation, through both design and implementation stages, with the result that the work process within that situation is changed.

(d) By 'computer worker', I shall mean all those whose job is primarily concerned with the computer either in its development, manufacture, marketing, application to a work process, routine operation or maintenance.

(1) THE COMPUTING INDUSTRY

Computing is very big business. In 1978 the total value of all sales and rentals of equipment and of all services associated with computing world-wide was about $US50,000 million.[1] Of this amount, over three-quarters was accounted for by the sales and rental of computer equipment, with central processors accounting for 32% and peripheral devices and terminals accounting for 44% of this amount. The remaining quarter was accounted for by services and supplies.

The market is expanding rapidly at the rate of about 20% per year and the profits of the large corporations are expanding at the same rate, or in some cases faster. This makes computing one of the most profitable industries in the world. Despite the low risks involved, the profit rate (profit as a percentage of equity) is very high with International Business Machines (IBM) regularly recording a rate of over 17%.[2] The profit margin is also higher than in comparable industries. About 10% of the revenue of the large corporations is after-tax profit. IBM has steadily increased its profit margin over the years from about 10% in 1961 to about 15% in 1977.

Many computing corporations are involved in other areas of business, particularly in the supply of accounting machinery, typewriters, private telephone exchanges and similar equipment. It is relatively easy to establish that their high profits derive from their computing interests. Figure 1 shows the top fifteen U.S. computer companies, their profits and profit margins for 1978. It also shows the proportion of their total business that is accounted for by their revenue from computing.

Company	Profit ($USm)	Profit margin	Involvement in computing
International Business Machines (IBM)	3,111	14.8%*	81%†
Burroughs	253	10.4%*	87%†
National Cash Register (NCR)	194	7.4%	74%
Control Data Corporation (CDC)	89	3.3%	68%
Sperry-Rand	177	4.7%	48%
Digital Equipment Corporation (DEC)	142	9.9%*	100%†
Honeywell	201	5.7%	37%
Hewlett-Packard	153	8.9%	38%
Memorex	42	6.6%	90%†
Itel	47	6.8%	71%
TWR	174	4.6%	12%
Data General	40	10.5%*	100%†
Amdahl	48	15.0%*	100%†
Storage Technology	27	9.0%*	100%†
ADP	27	9.0%*	97%†

* Profit margin of 9% or larger
† over 80% involvement in computing

Source: *Datamation*, May 1979 Supplement

FIGURE 1

PROFITS, PROFIT MARGINS AND INVOLVEMENT IN COMPUTING: LARGEST FIFTEEN U.S. CORPORATIONS, 1978

There is a remarkable correlation between those corporations showing a profit margin of 9% or greater, and those corporations for whom computing is at least 80% of their total business. Only one corporation, Memorex, prevents a perfect correlation (if we had taken their figures for 1976 we would have found a profit margin of 11.6%). From this it is very clear that the high profit margins correspond to heavy involvement in computing, and hence that computing is the source of those high profits.

As well as being large and profitable, the computing industry is also highly concentrated. The forty largest corporations receive over 88% of the total revenue and the ten largest account for nearly 65% (see Figure 2). The largest corporation, IBM, receives over one-third of the total world revenue. This makes its turnover greater than the Gross Domestic Product of the Philippines or Egypt and nearly as large as that of Greece. It also makes its revenue larger than the government expenditure of Brazil, Iran or Australia.[3]

This world market has, since the very first commercial computer in 1951, been dominated by the U.S. In recent years a serious challenge has been launched by Japanese companies who in 1978 received just over one-sixth of all revenues. Though weakened, this still left U.S. corporations dominating the market with over 75% of all revenue. The remainder, which is less than 10%, was shared between mostly European companies.

Rank	Company	Country	Revenue from computing ($USm)	Share of world market
1	IBM	U.S.A.	17,072	34.4%
2	Burroughs	U.S.A.	2,107	4.2%
3	NCR	U.S.A.	1,932	3.9%
4	CDC	U.S.A.	1,867	3.7%
5	Hitachi	Japan	1,830	3.7%
6	Sperry-Rand	U.S.A.	1,807	3.6%
7	Toshiba	Japan	1,633	3.3%
8	DEC	U.S.A.	1,437	2.9%
9	Honeywell	U.S.A.	1,294	2.6%
10	Fujitsu	Japan	1,248	2.5%
11	CII-HB	France	1,061	2.1%
12	International Computers Ltd.	U.K.	1,019	2.0%
13	Olivetti	Italy	789	1.6%
14	Siemens	W. Germany	703	1.4%
15	Nippon	Japan	672	1.3%
16	Hewlett-Packard	U.S.A.	657	1.3%
17	Philips	Netherlands	602	1.2%
18	Memorex	U.S.A.	570	1.1%
19	Nixdorf	W. Germany	554	1.1%
20	Itel	U.S.A.	487	1.0%

Source: *Datamation*, May 1979 Supplement

FIGURE 2

TWENTY LARGEST COMPUTING COMPANIES, 1978

The international trade in computers reflects the dominant position of the U.S. and Japanese corporations. Figure 3 shows that only North America and Asia are net exporting areas, whilst Europe and the rest of the world are all net importing areas. Even the 'export' figures do not necessarily represent the products of some local computer manufacturing industry, but rather represent movements of components from country to country within transnational corporations. It is also to be noted that the figures refer only to computers and we do not at present have figures relating to the international trade in computer services.

The computing market in Australia is practically unknown by comparison. Some of the larger U.S. corporations do disclose all or part of their trading figures in Australia, but a significant number publish absolutely nothing. From the figures that are published, from estimates of the size of their operation based on staff levels, and from our knowledge of the total value of machinery installed by each manufacturer,[4] we can produce estimates of the size of the operation of each of the large manufacturers. This data and estimates is presented in Figure 4.

Imports ($USm)	Region	Exports ($USm)
5,232	Western Europe	4,531
1,442	North America	2,951
827	Eastern Europe and U.S.S.R.	803
704	Asia	986
602	Latin America	176
277	Oceania	20
236	Africa	4
163	Middle East	12
9,483		9,483

Source: 'The World's Top 50 Computer Import Markets', *Datamation*, March 1978, p. 153.

FIGURE 3

INTERNATIONAL TRADE IN COMPUTERS AND OFFICE EQUIPMENT, 1975

From these extensions we can estimate that the largest of the overseas corporations employ about 9,800 people in Australia. This would be consistent with the estimate of the Australasian Computer Equipment Suppliers' Association in their submission to the Myers Committee.[5] In that document the computer manufacturers themselves estimated that between 12,000 and 14,000 people were employed by all the manufacturers of computers and computing equipment in Australia.

The same source, however, also estimates that a further 12,000-14,000 people are employed in the software and systems area. Only eight such companies were found in the standard Australian business directories and they employ only 1,605 people. This would leave at least a further 10,000 unaccounted for, except that they probably work for small software companies. We therefore cannot say that we know very much about the software industry in Australia and this is clearly an area that deserves further investigation.

Company	Revenue ($Am)	Profit ($Am)	Employees
IBM	161.906	16.554	2,000
Honeywell	(50)*	3.816	1,062
CDC	(22)	(2)	550
Sperry-Rand	74	(5)	1,800
Burroughs	(35)	(3)	(1,000)
ICL	(33)	(1)	1,000
NCR	50	5.8	1,700
DEC	15	(1)	250
Hewlett-Packard	15	(1)	210
Facom	(15)	(1)	(200)
Total manufacturers	(470)	(40)	(9,800)
ADAPS	2.4	.279	128
Commercial DP	2.241	.027	190
Computer Accounting Services (CAS)	7.988	1.006	210
Computer Sciences of Australia (CSA)	(10)	(1.3)	452
Datec	3.6	(0.4)	85
IDAPS	6.572	.954	140
Inf. Electronics	1.310	-0.624	100
Datronics	9.9	.670	300
Total others	(44)	(4)	1,605
TOTAL	(514)	(44)	(11,405)

* Brackets denote an estimated figure

Source: Jobson's Yearbook, Dun and Bradstreet's Directory and company reports.

FIGURE 4

MAJOR COMPUTING COMPANIES OPERATING IN AUSTRALIA, 1978

In addition to the 24,000-28,000 people mentioned above that are employed in computing in Australia, it is estimated that a further 45,000-50,000 people are employed in user organisations, making a total of around 70,000 people altogether. These are situated in about 11,000 computer installations, 8,000 of which are small machines requiring only a few staff. Of the remainder, 300 are very large systems, costing over $1 million to purchase, and the rest are medium-sized.

(2) REASONS FOR THE PRESENT STRUCTURE[6]

An examination of the background of the most successful computer manufacturers will reveal that they each fall into one of two groups. The first group consists of those corporations that have a lengthy involvement in business equipment and office machinery that precedes the introduction of the computer. IBM's history, for example, goes back over fifty years and they were involved in tabulating machinery, timing devices and typewriters before they became involved with computers. Remington-Rand (now Sperry-Rand), National Cash Register and Burroughs have similar histories.

The second group is formed by those who managed to enter the industry with a new technology and found a particular market that they could dominate. Notable examples of this type of company are Control Data Corporation (CDC), who entered in 1956 to concentrate upon the market for very large, scientific machines and grew as a result of military contracts and a series of twenty-two mergers and takeovers to become one of the 'Big Seven' by the 1970's. Another good example is Digital Equipment Corporation (DEC), who entered with the introduction of the transistor and cornered the market in minicomputers, eclipsing Philco who were the original pioneers of the technology.

From the many companies that, at one time or another, have been involved with computer manufacture but are no longer active, two further groups emerge. The first is formed by the small companies that were set up on the basis of a good technical idea, but with comparatively little capital or what is referred to euphimistically as 'business sense' (more about this later). Each new technological innovation brings forth literally hundreds of such companies with large sections of the industry at any one time being organised almost as a 'cottage industry'. Within a couple of years the majority of such enterprises encounter financial troubles and either disappear altogether or are taken over by larger corporations. There is some evidence to suggest that such takeover activity relieves the large corporations from heavy involvement in basic research as important new developments can be bought relatively cheaply in this way without the risks associated with research funding.

The second group is formed by the large corporations that had their normal product base in some other product area and bought into computing. Companies such as Bendix, RCA and General Electric all had substantial computer interests in the 1950s and 1960s and all eventually abandoned their computer manufacturing completely. The last two of these were reported as losing several hundred million dollars each in the experiment. The failure of such well-established corporations shows just how important the existing customer base was to the successful computer manufacturers — far more important than good technical ideas or even sound 'business sense'. In fact, technical expertise appears not to have been very important at all during this period and easy access to relevant markets seems to have been the most significant determining factor in establishing a dominant market position.

By 'relevant markets', I do not mean to restrict the field to commercial offices, however, as the granting of government, and particularly military, contracts was clearly crucial to the establishment of market leaders in the fledgling computer industry. It is no coincidence that both of the machines that claim to be the first computer, the Harvard Mark 1 and the ENIAC, received financial encouragement from the military and were used in ballistics calculations. Most of the pioneering machines of the late 1940s and early 1950s were built for, or sold to, the military. For example, the 'Raytheon Hurricane' was built for a defence network, the 'RCA BIZMAC' was built for the Ordnance Tank Automotive Council, the 'Harvard Mark III' was built for the U.S. Navy, the 'Elecom 1000' for the Ballistics Research Lab, the 'TRANSAC S-1000' was contracted by a U.S. 'government security agency', the 'Philco CXPQ' was contracted by the U.S. Navy, who also installed CDC's first computer, the IBM 'Defence Calculator' and their 'Military Computer' did not even bother to disguise their function. Then there was John von Neumann's most appropriately named computer, the 'MANIAC', which was built in 1952 and used in the production and testing of the hydrogen bomb.

Though access to the best markets was probably the most significant factor in the development of the manufacturing industry, marketing policies also played an important role in deciding 'who ate whom'. When we examine this area of good 'business sense' we find policies aimed almost exclusively at destroying potential competitors with little or no thought given to the customer (who is usually a large

employer anyway) or the employees affected. There are many examples of such policies that could be quoted but the following raise the more important issues.

Firstly, there is pricing policy. In general, the objectives of the large corporations in deciding their pricing policy has been to eliminate, not each other, but possible outside competition. To achieve this two specific policies were developed. 'Bundling' was first used by IBM and was a method of pricing whereby the cost of the machinery was 'bundled' together with the cost of software, education, maintenance, technical advice and so on, so that one all-inclusive price was quoted. This had the effect of removing all potential competition from such service areas and demanding a very high level of service from any potential entrant into the market.

'Leasing', as opposed to the outright sale of equipment, was also used by IBM to discourage competition. In order to recover the development and manufacturing costs in a market where the product is leased requires considerably more capital than a market where the same product is sold. With equipment that would retail at around one million dollars a piece and an estimated four-year period before the costs can be recovered in rentals, the effect of leasing is to demand that any potential competitor requires several hundred million dollars in order to launch a single product line. Both 'bundling' and 'leasing' are therefore pricing policies developed by the large corporations in order to protect themselves against outside competition.

Secondly, there are dubious marketing practices.[7] One example of which was brought out in the antitrust action brought by CDC against IBM for launching a 'knockout' machine against their range of large, scientific computers. A 'knockout' machine is a product that is either not developed or is in some other way technically inadequate, yet is launched onto the market in order to confuse a competitor's customers and delay or frustrate the signing of orders. It was argued that CDC had a sound product in an area where IBM had no comparable machine. IBM did, however, have a development project (called 'STRETCH') which they decided to announce as a product. IBM documents showed that they were aware of the inadequacies of the machine and that they were offering it at a price which would not even recover their manufacturing costs. It seems clear that IBM was prepared to forego its profit and good customer relations in order to try to remove CDC from the market altogether. IBM eventually settled the antitrust case out of court, but one of the conditions of the settlement was that CDC destroy its file on IBM's activities.

In another case, Telex, who manufactured disk drives that could be used with IBM central processors, accused IBM of pointlessly changing the design of their system purely in order to throw off the competition they were offering. By changes in the design of their system IBM could both require that Telex change its product in order to remain compatible, and reduce considerably the price of the component that Telex was competing against. At the initial hearing Telex were awarded $325 million damages, but this was overturned on appeal. The judge in the original hearing was clear in his summing up, however, and said that IBM's innovations were nothing but an attempt to

> constrain or destroy its plug-compatible peripheral competition by predatory pricing action, and by marketing strategy bearing no relationship to technological skill, industry, appropriate foresight or customer benefit.[8]

Thirdly, there are the efforts of manufacturers to establish brand loyalty. So successful have their efforts been in this regard that three out of every four computer users choose a machine from the same manufacturer as the original.[9] This is not because of a high level of satisfaction, but rather because the lack of standardisation of the industry has the result that enormous costs are incurred in changing the software (programmes, etc.) from one manufacturer's machine to another's.

And so, just as happened in engineering in the first half of the century, the issue of standards becomes the battleground between different sections of manufacturers. Within computing both the ISA and ASA standards committees are dominated by the large U.S. manufacturers whose main objective is, once again, to protect and extend their market position. Nowhere is this point illustrated more clearly than in the battle between the large manufacturers of total systems, and the manufacturers of peripheral equipment. It is clearly in the interests of the latter group for standards to be adopted concerning the interface between a central processor of a computer system and all its various peripheral devices. Individual companies could then develop their particular expertise, knowing that the particular component they develop will be compatible with all other machinery on the market.

The large systems manufacturers control the main standards committee (ANSI X-3), however, and such a move would not be in their interests as it would open sections of their existing market to outside competition. In 1974 ANSI X-3 voted to discontinue any further effort toward a standard interface. The effect of this is

> that IBM has the economic and market power almost instantly to change the current *de facto* standard, thus rendering the competitive devices obsolete in the marketplace.[10]

The resulting insecurity of the peripheral manufacturers has led them to experience even greater problems of market penetration. In one survey users were asked to consider the purchase of a disk drive unit that was in all respects identical to a specific IBM product and to say at what price it would have to be offered for them to switch away from the IBM unit. The results showed that it required a 20% reduction in price below the IBM level for a competitor to gain one-half of the market.[11] Looked at the other way, the market dominance of IBM enables them to extract very high rates of profit without fear of serious competition through price cutting.

Finally, there are various policies adopted by the large manufacturers that are aimed exclusively at self-protection. So-called 'defensive research' is one such example and involves the hiring of bright researchers in order to prevent competitors from gaining access to a technical innovation. This monopoly of research enables the manufacturers to plan the introduction of new technologies to comply with the maximum beneficial life of their product range.

The decision by manufacturers to market their own products, rather than allow the creation of a computer wholesaling and distribution industry has placed further obstacles in the way of sensible cross-comparison of products which has already been made difficult by lack of standards.

The control exercised over the introduction of new techniques, and the control exercised over distribution has meant that the planning of obsolescence is much easier. The average life of a computer system has, as a result, declined from about seven years in the 1960s to about five years in the 1970s.

Traditionally we tend to analyse the impact of technology upon an industry by studying the motivations of the employers within that industry and showing how they are at variance with the interests of the employees, or of society in general. In the case of computerisation such an analysis is quite inadequate. All the factors mentioned above contribute to a clear picture of the computerisation process being dominated by the computer manufacturers. Capital goods are thus introduced onto the market, modified and withdrawn from the market at the whim of their manufacturer. Pricing policy, research, standardisation and the method of distribution are all in their hands and their connections with governments and the military are well-established and crucial to their well-being. It is undoubtedly these corporations that control the computerisation process itself and the nature of the technology that confronts us each day. Freeing outselves from their domination will obviously be an important first step in gaining control of that technology so that we may make our own decisions concerning it.

(3) EFFECTS UPON AUSTRALIA

The fact that the computer manufacturing industry is dominated by a handful of corporations in one or two countries and that they act through self-protection and self-aggrandisement, is not automatically bad. It becomes bad when we can show that this domination and motivation results in policies which adversely affect Australia. In this section I will outline four areas where I believe this to be the case.

With respect to our economy, it has been estimated that the total value of computer equipment installed in Australia in 1978 was about $1,000 million, and that 98% of this equipment was imported.[12] The value of equipment imported during 1978 alone was probably worth about $300 million and we might assume that a further $100 million was spent on software and services. This gives us a total figure for 1978 of about $400 million in payments overseas, and this figure is rising at the rate of at least 16% per year.

Secondly, the domination is detrimental to our employment situation in the most direct manner. It can be seen from Figure 4 that the Australian-based companies employ about 36 people for every million dollars of revenue, whereas the overseas-based companies employ only about 21 people per million dollars of revenue. (It is also a noticeable trend that the larger corporations employ less staff than do the smaller ones, with IBM employing only 12 people in Australia for every million dollars of revenue, making it one of the lowest-staffed of all IBM companies.)[13] Neither do increased profits mean increased job opportunities in Australia. Honeywell, for example, increased its profits in Australia from $3.816 million in 1977 to $6.266 million in 1978, yet only increased their staff levels here from 1,062 to 1,064. Rather than using their profit to increase staff levels, Honeywell in fact paid a sum of $3.5 million to their parent company in the U.S.[14]

The third area of concern is the way that the domination prevents the growth of an indigenous computer industry. It has been noted that it is common for small companies to be formed in order to develop and market some particular piece of new technology, and that generally such companies are short-lived and either disappear or are taken over by larger companies. In the Australian context this will mean that any successful Australian manufacturer will, at best, be subject to overseas takeover as soon as their product appears to be succeeding. Such is the structure of the market that it is impossible for companies to survive and grow without enormous capital resources and substantial government assistance. Without them no Australian computer industry is able to survive.

It is known, for example, that U.S. companies are currently attempting to takeover four of the most successful Australian-owned computer companies.[15] In one of them a condition of the takeover is reported to be that the leading designer within the Australian company refrains from working in the area of computer design for five years. In another case, it is reported that a company is being taken over in order that access to expensive software can be obtained relatively cheaply. Having stripped the company of its software, it may well be closed down as the main objective has been achieved. 'Software stripping' may well become the 1980s equivalent of 'asset stripping'.

The fourth area is that of our ability as a nation to plan, implement and receive the benefits of changes that we decide to institute. The mechanism whereby the control of the computerisation process is removed from the Australian participants is complex and begins with the evaluation of the proposed system. Traditionally, computer systems are justified by means of cost-benefit analyses. In practice very little hard justification is carried out in the early stages because of the impossibility of comparing competing manufacturers' products, a situation deliberately created by the manufacturers to protect themselves from competition.

What is even more remarkable is the fact that very little cost-benefit justification can be established even after the computerisation process is complete.

Such a startling result may appear to go very much against the grain of what the Minister for Productivity and others have been saying recently, yet it has been verified in surveys carried out by John Diebold and the McKinsey Corporation, and is clearly believed by such researchers as Joan Greenbaum. The claim that computer users actually 'lose' money by computerisation is so radical that it requires further analysis.

One of the reasons why this appears to be the case is the failure of most implementations to work out as planned. According to traditional cost-benefit analysis a period of extra cost at the beginning of a project is eventually outweighed by a period of extra benefit at the end. Anything which either delays the point at which benefits begin to exceed costs, or shortens the entire length of the project, could seriously upset the calculations and result in a net loss.

Examinations of a number of installations would tend to show that both of these undesirable tendencies are at work. Equipment is delivered late by the manufacturer and frequently does not operate to expectations once it is installed. The design and implementation of applications programmes takes far longer than the user was led to expect. Constant changes to the manufacturer's hardware and software cause many minor delays in the procedure. Friction with the end users of the system was not anticipated. These, and many more factors, all lead to delays in the implementation of the system and the all-too-common problem of escalating costs.[16] Then, as soon as the system is working, a new level of technology is announced and figures produced to show the enormous 'benefits' to be obtained (next time) by replacing all one's existing system by some new product line. The result for the user is that costs have escalated, benefits have become very elusive and the computer manufacturer continues laughing all the way to the bank.

This, however, is only part of the story for if it were completely accurate then those companies that have heavily committed themselves to computerisation would have tended to be the ones that have gone out of business and this is clearly not the case. (This may be a simplification, for such companies may have been successful despite their involvement in computers and may have become dependent upon credit as a result.) What is more likely the case, though, is that computerisation is in some way beneficial to the users even though it is not financially profitable in the short term.

Joan Greenbaum seems firmly of this opinion when she states that computerisation is introduced basically for reasons of control over the work force and not for short-term profit maximisation. Computerisation thus fulfills objectives within the long-term strategic plans of management for the de-skilling and cheapening (and, often, feminisation) of the work force.[17] This view would seem to be supported by the findings quoted by Stoneman[18] to the effect that cost reduction was one of the least quoted reasons given by management for computerisation. Such a view also squares with my own belief that it is not so much the computer technology that is oppressive, but the reorganisation of the work process that is carried out as a precondition for computerisation that determines the true class nature of the process.

In these and other ways, the domination of the computer manufacturing industry has created a situation where neither the planning for computerisation, the control of the computerisation process, nor the benefits from computerisation reside in the hands of the Australian people. Multinational domination of this industry is therefore not just some bogey raised by the left, but is a real threat to our economy, our independence and our working people.

(4) NEW TECHNOLOGY

Recent publicity has tended to dramatise the revolutionary nature of the silicon chip. Whilst it is undoubtedly a major technical advance we must remember that wider social and economic factors will be more significant in determining its

effect upon society. In their own way, the valve and the transistor were just as revolutionary and we have seen how they were both absorbed into the existing structure of the business machine market. A large number of new companies were formed to develop and exploit the new technology with the major business machine companies maintaining an interest but holding back from large-scale involvement in the early stages. Then, as the products and the companies began to sort themselves out, these big companies moved in to absorb both the new techniques and the successful new companies and to reassert their dominant market position within the new product range. Usually only one or two of the new companies survived and grew themselves into major manufacturers.

The silicon chip technology would seem to be following the same path. Though hundreds of manufacturing companies have been formed, the manufacturing industry is moving steadily towards heavy concentration. Apart from such companies as IBM who manufacture chips only for their internal use, the total world market was worth about $4,000 million in 1978. Figure 5 shows that the seven largest manufacturers account for nearly 50% of the total market, and the largest manufacturer accounts for nearly 15% alone. Within the next few years we can expect the process of rationalisation that has already begun in the silicon chip manufacturing industry to continue and for increased mergers and takeovers to result in a monopolistic structure silimar to, and in many places overlapping, the large computer systems manufacturing industry.

Company	Revenue from sales of chips
Texas Instruments	660
National Semiconductor	330
Motorola	320
Intel	300
Fairchild	275
Philips (Signetics)	200
RCA	125

Source: Counter Information Services Report: The New Technology, p. 13.

FIGURE 5

SEVEN LARGEST MICRO-CHIP MANUFACTURERS, 1978

It is always difficult to predict the likely effects of a new technology, but I believe that previous histories in the area of electronic business machinery have indicated the clear pattern outlined above. That is, I would assert the dominant role played by existing manufacturers in this market area and their ability to absorb new technologies, and I would deny that a determining role is played by the technology itself in upsetting the existing balance of power between different sections of the manufacturing industry, between manufacturers and users, and between users and their employees. For this reason many of the predictions that one hears concerning the effects of micros on our society seem to me to be highly speculative.

For example, some people are of the opinion that the reduction in the cost of computer machinery will mean that the large system manufacturers will come under fierce competition from lower-priced products and hence their dominant position

will be undermined. Whilst there may be an element of truth in this, in that the large manufacturers will find it difficult to continue expanding at the rate they are used to, this does not necessarily mean we are about to witness the demise of IBM. It may mean that increased competition among these large manufacturers may result in greater concentration, but the total value of the large systems market shows no sign of going into decline. One of the major reasons for this is that companies such as IBM do not just sell computers, they sell solutions for businesses and their managers, and this is one of the prime reasons why their origins in ordinary business equipment fitted them so well for taking maximum advantage of the technology of computers. Whilst manufacturers of chip-based products may open up and succeed in a large consumer-oriented market, they will require considerably more than their existing skills, capital and influence if they are to begin to challenge the hegemonic role that IBM exercise within this ideological field. For this reason I think it unlikely that the manufacturers of silicon chips and their related products will have any serious effect upon the large systems manufacturers, except perhaps to add fuel to the process of market concentration.

There is a second argument that says that the reduced cost of machinery will lead to a reduction in the amount of labour-replacement that is necessary in order for the capital costs to be recovered. Therefore, it is argued, the cheapening of the technology will lead to less pressure on labour and less unemployment as a result. As attractive as this argument is, it must be totally dismissed as it is based upon a complete fallacy. Regardless of the phenomenal cost reductions quoted by computer manufacturers and their allies, the significant fact is that an *increasing* proportion of the total amount of money spent on computerisation is being spent on machinery and a *decreasing* proportion is being spent on labour.[19] The remarkable cost-reductions so often quoted are clearly not getting through to the users of the technology and the pressure on them to reduce their labour costs are just as great as ever.

Finally, there is an argument that the easy availability of computing power, now through retail outlets, will result in a breakdown in the tyranny of the computer expert and lead to some form of 'popular' or 'progressive' computing. Without wishing to deny the significance of such a trend, I believe it underestimates the strength of dominant ideology within the techniques and practices of computing. It is the case that miniaturisation and cost-reduction have served to retard significant developments in this direction rather than to enhance them. Hence it is the reactionary concepts of hierarchical organisation and imperative command structure that are being embodied within this new technology and significant theoretical advances are being confined to remote research areas. That silicon chip technology leads to increased popularisation of computing seems likely, that this popularisation is in itself progressive is highly questionable.

What then is likely to be the effect of this significant new technology? We have already noted that whilst chip technology does not directly affect the large systems market, it has the effect of limiting its expansion. This is because the new users buying a computer system for the first time are usually users of small systems and it is exactly these users that the micros are principally aimed at. Therefore the traditional source of new business has been cut off for these large manufacturers. Whilst they may well make attempts to break into this market they will have considerable competition from other large corporations with similar objectives. It is widely reported, for example, that Exxon, ITT and Volkswagen have all been buying heavily into the chip manufacturing industry.

One of the few opportunities for expansion of the large systems market has been in the Soviet Union and other socialist countries of Eastern Europe. So keen is IBM to enter this market that its actions have become overtly political. Not only was T.J. Watson Jnr., an ex-president of IBM, recently appointed U.S. ambassador to Moscow, but two ex-IBM directors, Cyrus Vance and Harold Brown, are the two members of the Carter administration who have devoted most energy to obtaining ratification of the SALT II agreement.

Such opportunities for expansion are clearly limited, however, and the main strategies of the large corporations are aimed at gaining markets from competitors. Here the same basic policies of pricing and increased demands for capital are used in order to attempt to drive competitors from the market. This time, though, it is not outside competitors, but competitors within the large systems manufacturers themselves.

Wall Street was reported as being severely shocked by the announcement that IBM's profit for the first quarter of 1979 was 'only' 13.2% higher than the same quarter in 1978. The Dow Jones Industrial Index fell seven points on the news. Revenue, however, maintained its steady rise at about 20% per year. Many people clearly feel that such figures (repeated in the second quarter of 1979), represent the effect of the microcomputer and are an indication of things to come. I think it is, but not in the sense that one may expect, for it would seem to indicate that IBM is foregoing some of its high profit margin in an attempt to force a price war with some of its nearest competitors. As we are entering a period when the large systems market is suffering some general constraint, so IBM appear to be ruthlessly using their position and power in order to attack their competitors within this sector and hence, in the long term, protect and extend their market.

In addition to this, they are preparing for a longer-term upgrade of services which will make it difficult for their competitors to keep abreast. This will involve the linking together of standard office machinery, computers and telecommunications into a single network. By means of such a development competitors will have to maintain the same global coverage, and the same breadth of product lines in order to remain competitive. By means of this move into word processing, satellite communication and such fields as electronic funds transfer, electronic mail, etc. IBM are merely 'raising the stakes' in order to shake off competition.

The effects of these developments upon Australia will not be desirable. Users can expect to be stranded with machinery from suppliers who are themselves in trouble, or who have gone out of business. Pricing policies, products, amendments to products, and back-up will all be manipulated for the benefit of the manufacturer rather than the user. New products such as word processors, telecommunications links, very large databases, domestic satellites, will be introduced primarily because that is the way that manufacturers will protect themselves and continue to expand. Whether or not we in Australia benefit from these technologies will not be the determining factor — unless we can make it so.

(5) HOW TO RESPOND?

In this last section I want to discuss what an appropriate strategy might be and what areas require further research. If we are happy that the main outline of my analysis is correct and that the process of computerisation in Australia is basically controlled by the large computer manufacturing companies in order to preserve and extend their market position, and that both the government and large companies within this country appear to assist them in this process by their general support for automation 'with no questions asked', then it is necessary for an alternative socialist strategy in this area to adopt a strong nationalistic position.

That is to say, a precondition for winning the benefits of this new technology for the ordinary people of Australia is that control of the computerisation process be wrestled away from the foreign companies and comes to reside within Australia. Hence the establishment of an indigenous computer manufacturing industry seems to be imperative. Though figures can be produced to show that such an operation would be uneconomic and would not survive the challenge of the large companies, these figures should not be viewed as statements of the inevitable. Similar figures were quoted by the Tories in the U.K. when Tony Benn was trying to set up ICL and yet the project, partly as a result of definite government policy, turned out to be a moderate economic success. Putting the figures aside for a moment, it is difficult

to see how non-involvement in the fastest growing industry in the world can possibly be in the interests of a country like Australia when the questions of balance of payments, unemployment and control over the technology and our way of life are all taken into consideration. If the economists tell us that it should not be done, then all that goes to show is that economists can be wrong.

Secondly, we need to separate the question of the manufacture of machinery from the question of the application of computers. In this latter area we must realise that control can only be exercised over the new technology if clear values and objectives are stated and the technology developed and applied in their light. That means we need to have positive views on the sectors of the economy, the functions and the areas of social and political life in which we think computers could be used beneficially, and we need to state most clearly the principles of democracy and of the distribution of benefits within which we want to see such changes take place. Unless we can do these things, our response to this technology will be negative.

Once such objectives are set, the activities of two groups need to be examined. The first and most significant group are those trade unions and their members who must come to understand the new technology. Recent union policies have indicated a movement towards greater participation in the introduction of new technology. Whilst this is a movement in the right direction much work needs to be done before this can be translated into specific demands and responses to particular proposed computer systems.

The second group consists of computer workers themselves and work must be done to change their views so that they no longer see themselves as technical experts who are able to devise the best solution in isolation from the work force but, rather, see their role as technical advisors to an essentially democratic process at the point of production. They must be shown the class collaborationist role they are currently playing and be encouraged to free themselves from it. In part this is a process that will come about as they are de-skilled and proletarianised and hence, hopefully, unionised too, but it is also to a large extent an ideological question concerning their attitudes towards their own work process.

The analysis given above lacks supporting material in several areas and hence suggests some areas that require further theoretical research. I would like to conclude by listing three such areas:

(1) What benefits do Australian companies that computerise actually get from the entire operation, what did they expect to get and how honest are their own appraisals of the situation?

(2) How does the dominant ideology operate in order to gain uncritical acceptance of computerisation, and how does it operate within the techniques of systems analysis and design to advance the interests of the dominant class?

(3) What are the connections between the large computing corporations, the ruling class in Australia and the state, both in their home country and here?

SUMMARY

This paper has been an attempt to pull together various material available in the literature in order to present an overall analysis of the computerisation process. It has identified the overseas-based computer manufacturers as the dominant force involved and argued that their activities are guided by a desire to defend and extend their market position. These activities are also detrimental to Australian interests in a number of different ways. Finally, some research areas are suggested and policies advanced in the hope that the left may begin a serious discussion of a counter-strategy in this crucial area.

FOOTNOTES

1. *Datamation*, May 1979 Supplement.
2. Brock, G., *The U.S. Computer Industry* (Ballinger, 1975), p. 221.
3. In 1976 IBM's revenue was $US16.4 billion.
   GDP: Egypt = 15.3; Philippines = 16.0; Greece = 21.0.
   Govt. exp: Brazil = 12.8; Iran = 13.9; Australia = 14.4.
   (All 1976 figures in $US billion.)
4. *Computers in Australia — Usage and Effects* (Foundation for Australian Resources, 1978), Appendix 7.
5. Reported in *Pacific Computer Weekly* 29/6/79, p. 1.
6. Material for this section was gathered mostly from: OECD, *Gaps in Technology: Electronic Computers* (Paris, 1969); Rosen, S., 'Electronic Computers: a Historic Survey', *Computing Surveys*, March 1969, p. 7.
7. For further details of this and other incidents see Rodgers, W., *Think* (Weidenfeld and Nicholson, 1970).
8. Quoted in Malik, R., *And Tomorrow...the World?* (Millington, 1975).
9. See Brock, p. 51.
10. Biddle, A., 'Standards, Monopoly and Competition', *Computers and People*, July 1977, p. 14.
11. See Brock, p. 48.
12. Ironically, this is from a U.S. Commerce Department estimate.
13. *Datamation*, July 1978, p. 228.
14. Honeywell Annual Report, 1978.
15. See *Pacific Computer Weekly* 13/7/79 and 31/8/79.
16. For an account of typical problems encountered see Mumford, E., and O. Banks, *The Computer and the Clerk* (Routledge, 1967).
17. J. Greenbaum, 'Division of Labor in the Computer Field', *Computers and People*, November and December 1976.
18. Stoneman, P., *Technological Diffusion and the Computer Revolution* (Cambridge University Press, 1976).
19. Barron, I., and R. Curnow, *The Future with Microelectronics* (Queensland University Press, 1979), p. 108.