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## INFORMATION TECHNOLOGY: FUTURISM, CORPORATIONS AND THE STATE

Frank Webster and Kevin Robins

**'The road to the social use of technology runs through the rugged terrain of interest groups, privileged classes, national power, and self-satisfied decision-makers.'**

**H.I. Schiller. *Mass Communications and American Empire*. Kelley, New York, 1970, p. 150.**

The significance of information technology (IT)' lies in the breadth of its potential impact on society: on work, communications, political processes, education and entertainment. It offers not just the possibility, in the current economic crisis, of restructuring work in order to gain greater control over that process the better to increase productivity, but also the possibility of a new cycle of growth in both capital and consumer goods, facilitating the restructuring of modes of consumption and the strengthening and recomposition of capital over patterns of leisure, communication and entertainment.

To date socialists have, understandably, adopted a defensive strategy by concentrating primarily upon the probable impact of micro-electronics on work and jobs.' Prognostications such as 'by early in the next century it will require no more than 10 per cent of the labour force to provide us with all our **needs**'<sup>3</sup> have induced many on the Left to paint a bleak, dystopian picture of the future. However, this is not the only image circulating: for this menacing and pessimistic scenario finds its utopian mirror-image in the prophecies of the many ideologues who are now heralding the new 'leisure society', the 'information society' of the 'silicon civilisation'. For these pundits unemployment and redundancy are seen as a reverse image: the loss of work is reformulated as the gaining of leisure. We are offered a future in which the work ethic has dissipated and in which we shall have a 'kind of affluent **redundancy**'<sup>4</sup> that heralds a new phase of civilisation, the post-industrial era.

We believe that these scenarios—the dystopia of unemployment, the utopia of leisure—are paradoxically complementary and both inadequate because each fails to understand the interconnections of work and leisure in our society. Not acknowledging that work and leisure are integrally tied they are unaware of the similarly close connections between production and consumption activities. Against such views in this article we shall urge that any socialist approach should be holistic and thus able to consider

the impact of IT across related spheres of society which make demarcations between leisure and work, production and consumption, economy and society ambiguous.

First, however, we want to make some observations upon the invocation of the 'leisure society' by many futurists. It would be wrong to dismiss such utopias as mere ideologies, for if we scrutinise them carefully we find that they contain a rational kernel. Moreover, socialists have for the most part not only abandoned the discussion of the future to these opponents, but they have also failed to examine closely the concept of leisure. In consequence, when confronted with futuristic visions of the ideal—leisure—society they often have no language to undermine the position of their opponents.

### *Information Technology and Futurism*

Optimistic forecasts of a 'leisure' or 'information' society have been propounded in a number of recent books, both academic<sup>5</sup> and popular.<sup>6</sup> The latter represent a significant phenomena in themselves as publishers vie with each other to announce the electronic era, the 'paperless revolution'. From these various texts there emerge a number of common themes relating to probable trends in the post-industrial, information-based society of the future.

1. *Administration.* Society, it is argued, has become too large and complex, and, thereby, unwieldy and unmanageable. Christopher Evans complains that the 'world's pool of "facts" has swollen' (p. 102): 'our world suffers from information overload, and we can no longer handle it unaided' (p. 67). The necessary aid is IT, viz. 'the computer is a tool for managing the mass society, since it is the mechanism that orders and processes the transactions whose huge number has been mounting almost exponentially because of the increase in social interactions'.<sup>7</sup>

2. *Democracy.* It is argued that this managed and administered society will also be a more democratic one. For Hyman, 'the wired society can tend to become a more democratic society by making a far wider range of information conveniently available. A few electronic communication channels under tight control is a recipe for dictatorship. Generous provision of communication channels is the road to freedom' (p. 29). It is a common futurist theme that social problems and antagonisms are the result of insufficient communication and/or information. Throughout the texts to which we refer it is constantly asserted that IT will iron out the creases in democracy. Large for instance suggesting that 'if every home had a viewdata TV set, then democracy could—if we wanted—become literally government by the people, and instant government at that, with daily push-button voting even on secondary issues' (p. 65).

3. *Affluence.* The solving of political and administrative problems is possible because economic problems have been dissipated in the electronic

Cockaigne of 'affluent redundancy' (Evans, p. 94). 'If the changes are conducted wisely, people will be able to set themselves free from the drudgery of production. . . Widespread automation could provide most of our material needs' (Burkitt and Williams, p. 42). The microprocessor will 'at long last make the humanistic dream of universal affluence and freedom from drudgery a reality' (Evans, p. 207). From the ashes of the work ethic will rise the phoenix of leisure: 'people will have the opportunity of using more free time to pursue their leisure interests, and more money to spend on them' (Burkitt and Williams, p. 11).

4. *Ecology*. Micro-electronics and IT will solve the problem of industrial pollution. Hyman suggests that 'the ecological movement and its associates and the silicon-chip-based revolution are in fundamental harmony and their proponents should make common cause' (p. 126). For James Martin, IT is one of those 'technologies that are environmentally sound, non-polluting, and non-destructive of the ecology of an overcrowded planet'.<sup>8</sup>

5. *The individual*. 'The new revolution in communications makes possible both an intense degree of centralisation of power, if the society decides to use it in that way, and large decentralisation because of the multiplicity, diversity, and cheapness of the modes of communication.'<sup>9</sup> Futurists argue that decentralisation is most probable: on the basis of new modes of communication 'there will be less centralised control over what people say and hear'.<sup>10</sup>

In such a decentralised society we shall be able to disperse the cloud of alienation that has shrouded industrial society. Hyman maintains, for example, that 'electronic money' could be one of the silicon chip's biggest contributions to 'the return of mankind to a human way of life'. And for Ithiel de Sola Pool, 'a picture begins to emerge of a society ever more individualised in its interests and tastes'.<sup>11</sup> This theme is developed extensively in Anthony Smith's *Goodbye Gutenberg* which suggests that view-data systems 'individualise information': 'the individual is being offered, to an ever greater extent, individual access to a totality of information'. The new media will promote 'individualised life systems', giving people 'the sense of their own and their possessions' uniqueness'. According to Smith, we shall move 'from a narrow editorial centrality to a profusion of individual choice'.<sup>12</sup>

#### *Futurism and Socialism*

The very prevalence of these futurist images that now rain upon us from television, bookstalls and the press induces us to take them seriously. They represent capital's utopia, its promised post-industrial land: a futuristic mirage so tantalisingly discernible to those now thirsting in the economic desert. One can readily see the ideological role of this planned, post-industrial society, in so far as it represents a dangerous disguise which permits a spurious escape from the anxieties surrounding the decisions and

happenings of the present. By offering a potential exit from the ills of the present electronic futurism floods in to fill an ideological vacuum. More than this, however, it is modelled upon, and becomes a caricature of, the image of a socialist society.

The appropriation of socialist language and the socialist vision by the pundits of post-industrialism is explicit. For Anthony Hyman 'the magnificent generosity of the new technology is at last beginning to make it possible for society to move in the direction of its old dream, never realisable but a splendid goal, the dream that was appropriated by Marxism and then lost in the monolithic politics of the twentieth century: from each and all according to their inclination; to each according to need' (pp. 126-27). Elsewhere, Christopher Evans maintains that the world will change, 'and for the better, and without the long awaited revolution of the proletariat' (p. 208).

The annexation from socialism of the language of social change is not to be lightly dismissed. By undermining and recuperating that aspect of socialism which talks of liberation and emancipation the ideologues of an electronic, post-industrial era threaten to structure and monopolise the terms of public debate while also blunting the critical edge of any socialist alternative by limiting it to 'actually existing socialism'. Moreover, because the current response to IT from the Left is piecemeal, trying to salvage jobs and negotiate working conditions in face of capital's initiatives, socialist reactions appear especially unimaginative and negative. In this situation it is not surprising that the futurists are confident of their ability to engineer social change. It is, therefore, important at the outset for socialists to show that behind the rhetoric of the 'information society' lies the reality of a managed, rationalised consumer capitalism. And it is necessary to move beyond this to reappropriate the language of liberation; to repossess the socialist tradition of utopian thought and generate an alternative image of a socialist future to that offered by 'information society' seers. The precondition for any such reappropriation is to reveal the absurdities of electronic futurism.

*Real Social Relations: The Power of Multinational Corporations in the IT Industry*

Behind the mask of futurism lies an imposing reality: the seemingly unstoppable juggernaut of multinational corporations, often moving in concert with state agencies. It is to this phenomenon that we now turn, taking heed of Raymond Williams's warning, issued a decade ago, that new technologies could be 'the tools of what would be, in context, a short and successful counter-revolution, in which, under cover of talk about choice and competition a few paranational corporations, with their attendant states and agencies, could reach further into our lives. . .'<sup>13</sup>

What we particularly wish to indicate is the scale of the interests

involved in IT, the extent of the restructuring now being undertaken, and the current significance of directive state intervention in this strategic industry. In addition, by highlighting the close connections between economic imperatives and political control that underpin the development of IT we can give the lie to those futurists and post-industrialists who imagine this new technology to be some neutral and inherently beneficial force. Against such imaginings what we can illuminate is an apparently inexorable trend towards greater concentration and centralisation being spearheaded by corporate and state institutions. At the same time our examination will suggest the limits of perspectives which concentrate only on the impact of new technology on the labour process. Looking at the enormity of changes in corporate and state structures reveals the need to conceive of IT in a broad framework which enables recognition that it will result in the intrusion of capital across a very wide range of social relations: the extension of capitalist planning, rationality and social management; a more intensive and aggressive exploitation of the sphere of leisure and the further penetration of the private sphere.

The growth of IT is creating a new industrial complex in which, as the head of Plessey observed, 'telephone, communications, data processing and electronics are increasingly converging into a huge fast-advancing industry'. With the distribution of computing, made possible by micro-electronics, and the linking of terminals through enhanced telecommunications facilities, there has come about a demand for information networks, for integrated systems rather than discrete products. Corporations are now restructuring themselves in order to be able to supply such data systems. A recent Hitachi report notes a greater interest in 'composite products requiring the combination of the technology of several of our divisions. . . We are working to use our electronic technology as a connecting element to tie together the products of our various sections.'<sup>14</sup>

IT offers, then, the prospect of a future overarching communications/computing information industry that threatens even to break down the traditional barriers separating domestic (leisure) from business sectors. The 'home of the future', offering integrated TV-based systems for entertainment, education, purchasing and accounting devices, is not radically different technologically from the 'office of the future' which provides a number of functions via data-processing and telecommunications facilities linked to visual display units.

Corporations previously ensconced in discrete areas, with established interests in distinct products and processes (e.g. computing, copying, telecommunications), are now having to rethink radically their strategies. Philips, in a representative comment, observes that

**in order to be able. . . to exploit the possibilities arising out of technological developments, a process of adjustment is necessary in many enterprises, partly**

having regard to the changed market and cost relationships. This also applies to our enterprise. If our technological know-how and our experience in different market areas are to be deployed as effectively as possible, a process of far-reaching rationalisation, production concentration and regrouping is called for in our enterprise.<sup>15</sup>

This entails a fundamental process of restructuring by many corporations to incorporate all major branches of IT within their spheres of competence. It further entails the hastening and consolidation of trends within capitalist organisations towards vertical integration (placing under one holding facilities for chip production through to end-product manufacture) and horizontal integration (regrouping around a coherent range of products and processes such as office equipment).

At present, however, this process of recomposition to form a single integrated information sector is at an early stage. Consumer electronics industries are working towards the establishment of integrated 'home entertainment systems' that incorporate TV, video, cable, computing and viewdata technologies (the intensification of domestic media consumption). And the business sector is moving (at a faster rate) towards the integrated 'electronic office'. At the present time this latter is clearly the key area: capital is readily available for investment in technologies that promise to rationalise the labour process in the office (the Taylorisation of office work) and thereby to increase productivity in this traditionally 'inefficient' sector. Nonetheless, both domestic and business sectors are becoming imbricated. Viewdata systems, for example, originally developed as an extension of television for leisure/private use, are now being marketed as an information tool for the office. Successful exploitation in this sector will decrease the cost of equipment and facilitate a further stage of growth in the consumer market.

Whilst it is as yet unclear which corporations will manoeuvre themselves into a position of market dominance we do know who the contestants in this struggle will be. The IT sector is already dominated by a select and powerful group of multinational corporations: IBM, AT&T (ironically the largest interest of all while the only one restricted to North America), ITT, Xerox, Siemens, Philips, RCA, GTE, Ericsson, GEC, Honeywell, Burroughs, NCR, Eastman Kodak, Thomson-CSF, Hitachi, Matsushita, Sony, Mitsubishi, CGE, Saint-Gobain, Exxon, Schlumberger. These organisations are able to dominate the IT market for a number of reasons:

- a) they have the resources to offer complete systems of compatible equipment; the trend towards integral systems impedes the access of smaller organisations to IT markets;
- b) they have an international reach and global strategies—vitaly important in the IT industry, which provides the data processing and communications infrastructure that underpins the increasing internationalisation of political, economic and administrative structures.

c) they have the resources to undertake expensive R&D programmes (at the upper levels well in excess of one billion dollars per annum). They are also able to take over strategic companies and to buy expertise.

Such characteristics as these cast doubt on extravagant claims that IT is an entrepreneur's paradise (a favoured theme of futurists): the business is restricted to a few giant (if currently competing) oligopolies of a size that is without historical precedent. Smaller organisations will survive only by adopting the role of clients and sub-contractors to these concerns.

The outcome of the present phase of restructuring around IT which is taking place on an international scale is by no means certain. It is a far cry from the idea of a rational, managed 'information society' to the chaotic and unplanned strategies for arriving there, shaped as they are by market forces and aggressive competition between powerful capitals. We can see the ad hoc nature of current developments if we focus on the British IT industry. Such a close perspective also draws our attention to the scale of the powerful economic interests that are the real forces—the blind architects—behind the post-industrial society.

Three corporations (GEC, Thorn-EMI and Racal) head the British effort in IT, with three others (Plessey, Ferranti and ICL) playing a strong supporting role. All three leaders have made major acquisitions in recent months in order to strengthen their strategic position. The strategy of the largest, GEC (with about three hundred subsidiaries scattered around the globe) illustrates the tendencies towards vertical and horizontal integration. Recently it has bought out Averys Ltd. as 'part of the company's plan for supplying office and business systems'<sup>16</sup>; it has purchased the office equipment firm A.B. Dick, Circuit Technology and Scriptomatic to consolidate its position in the American market; it has negotiated deals to produce, under license, television sets with Hitachi and video tape-recorders with Ampex; and it has gained an agreement with Mitel Corporation of Canada to obtain their advanced integrated circuit technology. GEC, reputed to be in possession of some E700 million for investment in 1979, has spent most of the money committed to date in the USA: it intends to continue this policy of investment in the world's largest single market.

GEC also made a bid for Decca in late 1979 but was beaten to the merger by Racal which paid £106 million in April 1980. Racal, the most profitable European electronics firm, took over Decca not least for its 'technological capabilities'<sup>17</sup> and its established position in electronic warfare (the area where Racal made its fortune and which has fuelled its dramatic growth over the past decade from a turnover of E16.5 million to 36262.7 million). However, the merger had also much to do with Racal's extension into data communications (its largest contributor to profits since 1979, when sales in this area jumped 18 per cent). Racal quickly reorganised Decca, selling off parts of the company (television

manufacture, records and tapes) that did not fit into its corporate strategy, and forming a new company, Racal-Decca, to concentrate the whole of the capital goods interests into one group. During 1979 Racal also announced a big move into the computer-based office systems market by establishing a subsidiary, Racal Information Systems, and acquiring 85 per cent of Hyperon Consulting Engineers to help apply microprocessor technology to a range of communicating computers. More recently, Racal bought Tele-systems Network of America, a company specialising in data protocol converters, devices which are crucial to the planned extension into computer information networks. This in turn will join Racal's successful **US** data communications subsidiary Milgo (bought in the late seventies).

Thorn, which acquired **EMI** late in 1979, lacks strength in the major **IT** market of office systems, being an oddly heterogenous company with chiefly consumer electronics, defence and engineering interests. Significantly, its main strategy in the near future seems to be aimed, therefore, at domestic **IT** systems (where it must tackle the mighty Japanese). It was this that stimulated Thorn's interest in **EMI**, a move which 'could not have been supported for its immediate benefits in terms of present profits but its importance in our strategies for the 1980s is of great significance'.<sup>18</sup> Thorn's plans to move towards the manufacture of integrated entertainment/information systems for the home largely explains the appeal of **EMI**, since the latter has very substantial interests in music and leisure. Thorn clearly regards **EMI**'s software capacity as complementary to its own television hardware capabilities. To this end, it divested itself of any **EMI** holdings—for example medical scanners—extraneous to its own future strategy.

Along with this vertical integration strategy, Thorn has also been conducting a policy of horizontal integration, extending its range of consumer electronic goods by investing heavily in video tape and 'video . . . disc (in conjunction in the **UK** with Victor Company (JVC) of Japan and with **GE** in America). It is now planning to start video disc pressing facilities for European and **US** markets using **EMI**'s expertise; is introducing its **TX9** and **TX10** TV receivers as the most technologically advanced in the world; developing colour TV receivers which incorporate viewdata facilities; and producing, in combine with **ICL**, its own viewdata system—Thorn-tel—under the strategically important subsidiary Thorn Television Rentals. This is significant because, given the high percentage of **UK** homes which rent television, and with Thorn controlling a large part of that market, it can guarantee outlets for its manufacturing capacity. With **EMI** under its wing Thorn now has a strong supply of programme material (film, music, television shows—**EMI** owned a large part of Thames Television) to support its hardware capacity, enabling it to offer 'new products for those new markets just when the customer requires it'.<sup>19</sup>

More briefly, the fate of the second rank of corporations in the British

IT industry (Plessey, Ferranti, ICL) is more precarious; none is in an especially favourable position, economically or strategically, and there have been signs that they (or parts of them) may be absorbed into one or other of the leading three. Plessey, a defence and telecommunications group with a turnover nearly three times that of Racal, yet managing only a similar total profit in 1979, has a very large stake in telecommunications equipment (about one third of its sales) and, although outside this area it is weak (apart from defence), it is nonetheless important as regards IT in the UK, chiefly because of its 'developments in progress covering a comprehensive range of data, voice and digital systems products'.<sup>20</sup> To this end it entered the office equipment market in 1979 by renaming Plessey Telecommunications Plessey Telecommunications and Office Systems and incorporating a specialist office systems subsidiary which will use Plessey's private digital exchange as the hub of its sales effort. As well as this entry into a major area of IT via its strengths in communications, Plessey's role as a supplier to British Telecom (Plessey has 38 per cent of B.T.'s business for exchange products and more than 20 per cent of its sales in the UK go to B.T.) is of special significance given the strategic position of the latter. Plessey also has by far the largest UK-owned integrated circuit operation, which it is developing on the basis of its telecommunications interests. Both these aspects of Plessey's business have attracted the attention of GEC in recent months while there are other parts of Plessey which would be attractive to both GEC and Racal.

Ferranti, an organisation specialising in electronics and computers, had to be bailed out of bankruptcy by the then Labour government in the mid seventies (its 50 per cent holding owned by the NEB was returned only in 1980). It looked a very likely candidate for merger with Racal or GEC, despite its wishes to remain independent, until 1980 results showed a dramatic recovery with interim profits up 83 per cent. Nevertheless, Ferranti's small size and established markets in defence information systems make it especially vulnerable to takeover in the eighties. ICL, whose primary interest is the computer sector, was formed in 1968 by a government-led merger. Its concentration on large mainframe computers has confronted ICL with the formidable competition of IBM (which to date it has handled well, being the only computer company in Europe to have an equal share of the domestic market with IBM). The policy of mainframe production is now being revised in face of cheap and more powerful computing capacity being made available by micro-electronics. Whilst it remains a significant company (despite a recent spate of crises—a 46 per cent drop in profitability in 1980, threats of US takeovers, large-scale redundancies and the sacking of senior management plus £200 million from the state to ease a liquidity problem), ICL will be forced to augment its facilities if it is to compete in the IT arena. As with other second order corporations its future is uncertain, though surely traumatic as it is forced

to restructure. For the second order the choice is between establishing a particular niche in the industry or becoming subsumed, as strategic arms, within the larger empires.

On a world scale, these British companies, all multinational enterprises with massive resources, are relatively small fry. Nevertheless, the process of jostling and manoeuvring for market supremacy is representative of what is happening in all advanced capitalist countries, at national and international levels. The so-called post-industrial or information society is effectively being shaped by multinational electronics corporations, now engaged in an unprecedented struggle that brings into conflict previously discrete sectors of that industry. National Semiconductor, a manufacturer of micro-electronic components, has, for example, developed its interests from microprocessors to mini-computers, and is now entering the main computer market. Other microprocessor producers such as Texas Instruments and Intel are following the same pattern. And end-product manufacturers in various sectors (e.g. AT&T in telecommunications, Philips in consumer electronics) have developed in-house facilities for chip production. Elsewhere, computer manufacturers, notably IBM, are developing interests in telecommunications. And corporations traditionally involved in the latter sector (AT&T, GTE) are strengthening their computer capabilities. The growth of the IT industry has unleashed a centripetal force that is drawing all sectors of the industry together into the fierce vortex of competition.

In this hazardous industry the most certain development is that towards integrated computer-communication systems for business use. Here the stakes are particularly high and the rewards potentially enormous. The really crucial developments are now occurring in the USA—crucial because they will have repercussions throughout the world. Also important to note, in the light of our later observations on the role of the state in the European and Japanese IT industries, is the contrasting role being played by the American government, which is deregulating the IT sector in order to stimulate competition (a move easily explicable in terms of the particular strengths of leading US corporations).

The US state has for some time been pursuing a policy of deregulation of telecommunications which, until the late sixties, was regarded as the 'natural monopoly' of AT&T (still with over 80 per cent of the domestic market). This policy, according to a representative of the Federal Communications Commission (FCC), intends that 'communications business entrepreneurs can be sure that the marketplace and not the government will decide their fate'. It results from a recognition of the changed circumstances brought about by IT: whilst the purveyors of data processing services have increasingly made use of telecommunications channels (cable, satellite, microwave radio) traditional communications interest have, with the growth of IT, encroached upon the area of data processing. AT&T has long been aware of both the promise and threat

that this new situation poses. Its response has been to strengthen its interests in the computer sector whilst consistently fighting a rearguard action against encroachments onto its carrier monopoly.

Competition over communications channels is not, of course, an end in itself. Control of this enabling technology is inseparable from achieving the maximum share of communications traffic. A major, and increasing, part of this traffic will consist of data/text communication. So important is this that data processing and telecommunications are now rapidly fusing into a single technological complex.

In our 1979 *Socialist Register* article we began to look at the growth of data networks from the direction of comparatively small companies exploiting—and stimulating—the erosion of AT&T's telecommunications monopoly. Since then a fierce struggle in the integrated computer/communications sector has been fully unleashed by the 1980 decision of the FCC to deregulate enhanced (i.e. text and data transmitting) telecommunications services. This has opened the path to unfettered competition between major telephone and data processing companies over the provision of computer-enhanced equipment and services. In this historic decision the FCC voted against requiring corporations offering computerised telecommunications services to get prior approval before offering such services, and it voted not to regulate the tariffs they charged. The FCC also freed AT&T from restrictions, allowing it to enter data/text communications. The FCC decision sets the scene for titanic battles between major communications and computing corporations as they fight for the IT market.

The leading protagonists in the coming war are AT&T, Xerox, and IBM, with the phalanxes of ITT, GTE, Wang and RCA playing important supporting roles. The main confrontation is between AT&T and IBM, each preparing to invade the other's previously sovereign territory, whilst defending its own empire. AT&T is trying to enter the data processing business and to keep all but common carriers out of the telecommunications business; while IBM feels the need to ensure that its computer products have an independent communications link on which to operate, thereby guaranteeing the viability of its planned 'office of the future'. All sides recognise that the next few years will be full of drama. Bell chairman C.L. Brown talks, for example, of 'head-to-head' competition being imminent—of AT&T being drawn into 'a corporate struggle—with IBM, RCA, Xerox and many other giants'.<sup>21</sup> As we write we cannot tell whether the scene being set will indeed result in a fight which will leave some companies mortally wounded or whether a less bloody compromise will be found.

### *The Role of the State in the IT Industry*

It is evident that the growth of IT is resulting in profound upheavals in

the electronics industries: we have referred to the scale of this corporate restructuring, the dominance of multinationals, and the current struggle for supremacy in the lucrative US computer-communications sector. The rationale for entry and participation in these markets resides in the profit motive. Corporations are guided not by social needs, but by the demands of capital accumulation and any futurist speculator should first take note of these massive commitments of capital in the IT industry.

However, in focusing only on the strategies of multinational corporations in the IT sector our discussion remains as yet incomplete. Clearly, the 'information society' will not depend only on the independent strategies of individual capitals in the electronics industry. At this stage, therefore, it is necessary to refer to the important supportive and orchestrating role of the state. The IT industry represents an area in which the presence of the state is especially apparent. In the UK, for example, the state is intervening to:

- a) create a sense of awareness and acceptance of IT;**
- b) speed the development of IT by funding and directing research and development;**
- c) integrate and consolidate disparate corporate interests to meet expected competition from foreign corporations and state institutions;**
- d) subsidise IT ventures from public funds and, if necessary, instigate IT industries under state auspices;**
- e) act as an especially important market for IT products and services, particularly through defence spending;**
- f) create an IT infrastructure, i.e. the structural framework of an 'information society' (e.g. in legislation, education etc.).**

To some extent this state involvement may be explained historically. For, in Europe at least, the national post, telegraph and telephone authorities (PTTs) have exercised a traditional monopoly over communications channels. The rationale for this has been a technical one: that communications channels represent a scarce national resource and that a regulating agency is essential to establish agreed standards and protocols for operating national and international networks. On the whole these technical criteria have not to date been contested and telecommunications has been accepted as a 'natural monopoly'. Nonetheless, the political implications of state supervision of communications are extremely significant. All the more so when, as in the case of IT, telecommunications becomes integrated with data processing and storage (with all that implies for surveillance).

However, the nature and scope of state involvement in the IT industry is also being shaped by other forces that derive from the strategic importance of the new technology and the nature of the present social and economic crisis. We want now to outline what seem to us to be three of the most significant factors.

1. *The 'Anarchy' of Capitalist Production.* We have argued that IT is of such strategic importance for capital because of the broad impact it will have on all spheres of society. No individual capital, however, has the resources or the planning capacity to ensure the successful establishment—and optimum exploitation—of IT. The objectives of individual capitals in competition are not necessarily those of 'capital in general'. It is therefore necessary for the state to orchestrate and rationalise—in so far as this is possible—the 'selfish' and potentially 'anarchic' activities of individual capitals (like GEC, Racal etc.).

In addition, the significance of IT is such that it will necessarily bring about profound social changes. Further social disruption will be produced as a result of the narrow interests pursued by multinational corporations. It therefore becomes the responsibility of the state to smooth these upheavals—again, in so far as this is possible.

2. *International Competition.* A further reason for state involvement in IT arises from the enormous scale of foreign, particularly American, competition. The might of US corporations like AT&T and IBM is such that the American government has been able to 'withdraw' from the industry. Although it still plays a distinctly supportive role for capital, serving as an outlet for IT products and providing R&D funds, it has opted to deregulate the industry, maintaining that market forces and competition between (strong) corporations will produce the most viable infrastructure for the 'information society'. The might of these corporations is such that indigenous capital outside the USA, if it is to have any real chance of achieving a substantial market share in the international IT industry, requires the support of a strong and active state.<sup>23</sup>

In France, Alain Minc and Simon Nora have recognised this difficulty of competing with American capital: 'the omnipotence of IBM throws the game off balance':

**The only 'cartel' capable of establishing a dialogue with IBM is one that could be formed from an alliance of telecommunications agencies. The basic task of the authorities, then, is to strengthen the French role in this association. By acting as a lever in this way, they will realise the objectives and means for establishing a national communications policy.**

The French state, they argue, must intervene on behalf of French capital to create data banks; to ensure network standardisation; to establish a European capacity to build and launch communication satellites; and to strengthen and co-ordinate individual capitals. Nora and Minc provide an example of a self-conscious response to the 'défi américain', a recognition that the state must intervene to 'deal' in a coherent way with threats to (its) economic stability, the "social consensus", and national independence.<sup>23</sup>

3. *The State as Social Capital: Efficiency and Control.* In a discussion of

the role of technology in the capitalist labour process, David Gordon<sup>24</sup> has distinguished between its introduction for reasons of quantitative efficiency and its introduction for reasons of qualitative efficiency. The former refers to the introduction of machinery in order to 'effect the greatest possible useful physical output from a given set of physical inputs'. Concern with quantitative efficiency derives from the need to increase productivity in the face of competition from other capitals. Qualitative efficiency, on the other hand, refers to the maximisation of 'the ability of the ruling class to reproduce its domination of the social process of production and minimise producers' resistance to ruling class domination of the production process'. It relates to the use of technology to control labour processes, and the determining factor in this case is the struggle between labour and capital.

While it is dangerous to extrapolate from the capitalist labour process to social capital, nonetheless, we feel that it is important to try to understand the role of technology for the reproduction of the wider social relations (family, state, law, leisure, etc.) that are implicated in the accumulation of capital. We would argue that, in so far as it has become integrally involved in economic planning and management, the state too follows criteria of quantitative and qualitative efficiency. Thus, one aspect of the state's involvement in IT is to introduce a technology that will increase productivity, rendering indigenous industries more profitable and competitive on an international scale. The state's criteria here are precisely those of the multinationals, as Nora and Minc make clear. While warning that IBM 'will participate. . . in the government of the planet' (p. 72), that 'the politics of network systems will decide whether telematics remains the activity of some powerful fiefs or is distributed democratically' (p. 84), their proposals are for 'rationalisation' of the French IT industry, union with AT&T against IBM because the 'interests of these behemoths are divergent' (p. 78), acceptance of 'increased unemployment' (p. 4), pursuit of 'new growth' and more 'foreign trade' (p. 60) as panaceas. In supporting the IT industry, the state is operating then according to criteria of quantitative efficiency. We are constantly told, in Britain, that 'British industry is falling behind its overseas competitors' and that new technology can 'improve our export performance and reduce our dependence on imports'.<sup>25</sup> Not only does this 'economic' rationale appear to be self-evident and unproblematical, but also it is invariably presented as the sole criterion guiding the state's actions.

The impact of IT will not, however, be restricted to the 'economic' level: it will entail a significant social upheaval and recomposition. The state will attempt to exploit these social changes to the advantage of capital. That is, it will operate according to criteria of qualitative efficiency—on the scale of social, rather than individual capital. It must seek to establish the domination of the ruling class over the social process

of production and to minimise resistance to such domination, not just within the immediate process of production, but across the whole of society. The state, as that aspect of capital most able to assess the interests of 'capital in general' (as opposed to that of individual capitals) must reassert the command relation of capital throughout society: the Thatcher government is well aware that productivity and competitiveness depends on a 'disciplined' working class. The reassertion of discipline is especially important for capital in the context of what Ralph Miliband has called a 'state of de-subordination', which effectively constitutes a repudiation of the integration of the working class into contemporary capitalist society.<sup>26</sup>

Information technology provides some particularly significant means of 'reintegrating' the working class back into the capital relation: through the provision of new consumer goods; through the increasing privatisation of leisure; through the transformation of labour processes; through sophisticated surveillance files, etc. As such, IT threatens to extend to society as a whole that which Taylorism and Fordism initiated at the level of the plant. This suggestion of a kind of 'social Fordism' should be seen in the light of Gramsci's observations on 'Americanism and Fordism'. We believe that the increasing interpenetration of methods of work and modes of living (and thinking) that Gramsci noted is now entering a new phase.

Noting that the success of any nation state in social management is by no means assured, we want now to review the attempts of three such states to choreograph the 'information revolution'.

### 1. *France*. Ex-President Giscard d'Estaing recently outlined

An *active* policy of government encouragement for the development of electronic components and of data processing. . . The creation of five industrial units in the field of integrated circuits, the setting up of an Agency for the promotion of data processing, the allocation of **E250** million of public money over five years for industrial development and the launching of new telecommunications services. . .<sup>27</sup>

This was both to strengthen the French IT industry and to assist the growth of 'a new civilisation' based on 'telematique'.

The French state is planning a framework of progress towards a forthcoming 'wired society'—a strategy which has been consciously influenced by the government report prepared in 1977 by Nora and Minc. The key to French policy is to create a mass domestic market for IT which in turn will provide a springboard for future export expansion. The centre-piece of this strategy is the replacement by the PTT of printed telephone directories with cheap electronic terminals linked to computerised data banks. Though initially these terminals will be simply for information regarding addresses and telephone numbers, their importance lies in the widespread introduction into society of computer terminals which can in

future be enhanced simply by extending the data held at central computers.

There are also plans from the PTT for viewdata and teletext systems as well as electronic mail services; France has had, since 1978, a nationwide data communications network (Transpac) and is due to launch a satellite in 1983 (Telecom 1) which, among other things, will offer sophisticated business communications services. The French system of viewdata, Teletel, is now competing for the enormous potential market that will come to that system which is accepted as the industry Standard.

These initiatives follow a history of encouragement by the French state of an indigenous IT industry which has culminated in a restructuring into three large groups. The first involves a regrouping of the country's leading electrical group, Compagnie Générale d'Electricité (CGE), whereby all the company's activities in private communications, computer systems, peripherals and services are to be brought together under Compagnie Générale d'Electrique. The second reorganisation coincides with a shareholding change in late 1979 at Cii Honeywell Bull (53 per cent French, 47 per cent Honeywell), the computer manufacturer, bringing it under the influence of the large and diversified company Saint-Gobain-Pont-à-Mousson. Cii Honeywell Bull was itself an enterprise initiated by the French state in 1976 and subsidised throughout the seventies as an attempt to make France less dependent on IBM. Saint-Gobain, itself 6 per cent state-owned, took major control of Cii Honeywell Bull by acquiring a 20 per cent holding when CGE withdrew in 1979. At the same time, Saint-Gobain also managed to gain a 23 per cent stake in the Italian firm Olivetti during 1979 in order to consolidate its prospects for IT. The third interest is the Thomson group, an electric and electronics conglomerate, whose subsidiary Thomson-CSF reorganised in 1979 to establish Thomson-CSF Informatique. Thomson has been allotted a major part in the strategy of establishing a strong and independent French IT industry: to this end the French government supported it by persuading ITT and Ericsson to relinquish to Thomson the controlling shares in their French subsidiaries.

What is particularly interesting about the French example is the self-conscious and articulate nature of the attempt to co-ordinate the interests of individual capital through the state in order to lay down the foundations of the 'information society'. It represents an explicit attempt to maintain 'economic stability, the social consensus, and national independence'. In the face of social disruption, Noi-a and Minc hold on to the futuristic mirage of a 'post-industrial' society: echoing McLuhan, they argue that the computer 'will alter the entire nervous system of social organisation'. They write of 'the real upheaval of civilisation for which the computer revolution may be responsible'. Here the strategies of state and capital fuse with the ideology of a post-industrial utopia.

2. Japan The French strategy is modelled on the Japanese plan for an

'information society'. As with the French, so too the Japanese look to a post-industrial future, regarding IT—again echoing McLuhan—as the 'nervous system of the future economy'.<sup>38</sup> However, behind this plan, which has been nurtured for over a decade, lies an aggressive commercial strategy. The aim has been to develop an indigenous computer industry and a strong domestic IT sector on the basis of which it would be possible to expand into foreign markets. This would replicate the successful strategy previously adopted with consumer electronics (radio, TV, video, etc.).

The Japanese state has played an especially active and directing role in laying the foundations of the 'information age'. This strategy has developed through a combination of protectionism, preferential purchase, selective joint deals with high technology foreign corporations, considerable state guidance and support for R&D, and state-guided corporate co-operation in the genesis of IT systems. Arguably the most important moves have been pioneered by Nippon Telegraph and Telephone (NTT), the government institution which, like all telecommunications monopolies, is charged with laying an IT infrastructure. For years NTT has nurtured domestic industry by buying almost exclusively from a group of Japanese telecommunications equipment firms. Claiming that this is essential to assure standards and protocols, it has offered the security of guaranteed markets to such concerns as NEC, Hitachi and Oki Electric. In this way NTT is working towards a sophisticated telecommunications infrastructure, using digital switching systems, to provide advanced data, text and image services.

In any discussion of Japan's interests in IT it is necessary to consider not only the especially enthusiastic and determined part played by the state, but also the nature of the *zaibatsu* corporations which dominate the economy. A legacy of pre-war Japan, the *zaibatsu* regrouped in the fifties when anti-trust legislation was eased. Critical for this regrouping was the fact that *zaibatsu* banks had been left untouched in the general dissolution following the war, and they were therefore able to take a lead in the restructuring of Japanese industry. There is some mystery about their operations, but there is no doubt about the importance of this 'highly important grouping of independent enterprises, clustering around one or several core city banks, with some co-ordination of policies, some joint action even, and personal regular meetings of the presidents'.<sup>39</sup> The Mitsubishi (86 firms in the group), Mitsui (71), Sumitomo (80), Furukawa, Fujo and Matsushita trading groups play a particularly important part in IT, including as they do such interests as Toshiba, NEC, JVC and Fujitsu. These *zaibatsu* are especially powerful and competitive because their size and structure—the electronic companies are already largely vertically integrated with considerable horizontal integration—make them capable of drawing on the necessary internal resources for development of high

technology. In this situation the inclusion of banks, which typically supply about 30 per cent of a member company's debt within each of the zaibatsu, is of special significance.

Japan has pre-eminently developed a corporatist structure in the post-war period. Its

**very high rate of capital accumulation has been achieved through an interlocking system of government supervision and private exploitation which has no equal in the other advanced capitalist countries. . . over 90 per cent of all government activity was devoted to looking after business.**<sup>30</sup>

This alliance of large interconnected corporations and directive state power makes for a mighty challenge to US supremacy in IT.

3. **Britain.** Britain provides an enigmatic case of the relationship between state and IT industry. Under the Labour government policy was developing in a way similar—though more piecemeal and less ideologically self-conscious—to the French strategy. In November 1978 the Labour administration committed a total of £400 million with the aim of forming an integrated IT industry made up essentially of four strands: Inmos (for the manufacture of semiconductor devices), Insac (for programming), Data Recording Instruments (for computer peripherals), Nexos (for the important office equipment market). These were all to be under the auspices of the National Enterprise Board (NEB) which undertook a five year plan of action. In addition, Labour also introduced a Microelectronics Industry Support Programme with financial support to bolster private investment and a Microprocessor Application Project to help 'educate opinion' about the virtues of IT. This was combined with plans for the Post Office to develop advanced telecommunications services: in recent years it has been introducing electronic switching equipment (the well-known System X is essential for IT), data and facsimile transmission services, and the Prestel viewdata system. These ambitious and co-ordinated plans suggested a coherent approach to IT which could not be matched in its cope by the private sector.

However, in May 1979 the Thatcher government came to power doctrinally opposed to state-supported initiatives in the economy. Already a shadow industry minister had expressed the view that Conservatives were 'deeply sceptical of the whole Inmos venture' while arguing that private enterprise be left alone to develop the new technology. At the same time disquiet was voiced about the Post Office concerning its unfair monopoly, its inefficiency, its inability to cope with rapid technological change, etc. More generally, leading figures articulated direct opposition to the spread of corporatism in the UK and called for a 'return' to free enterprise.<sup>31</sup>

In line with such attitudes expressed against 'collectivist' solutions to

problems posed by IT the new government commenced a campaign aimed at disposing of NEB assets. To this end various companies were placed in the hands of the receiver, a **50** per cent holding in Ferranti was returned to the private sector and the state's **25** per cent interest in ICL was relinquished. It is this emphasis on the private sector that, characteristically, lies behind Conservative policy. The government would appear to consider that it is possible to emulate the American (rather than the French) model: that competition in the IT industry will yield optimum results. At the same time as the Tories are trying to hold back on direct state intervention in the IT business, however, it hardly needs noting that it is vigorously encouraging the use of IT to strengthen capital in general, especially by bolstering the control agencies, summed up in the apt slogan 'strong state: free market'.

Whilst they may be reluctant to become the bureaucrats of a managed and administered post-industrial society the Conservatives are not, however, blind to the need to play some role in this industry. Significantly, Sir Keith Joseph hesitated to 'privatise' all the NEB's investments, particularly its IT holdings, coming round to recognising its role as a banker supporting a new technology that is still in an embryonic (and tender) condition. The minister redefined the NEB's function with regard to IT as 'a catalytic investment role, especially in connection with advanced technology and increasingly in partnership with the private sector'. Moreover, while shying away from an avowed corporatist strategy the government must necessarily continue to fulfil traditional functions for the electronics industry in order to stimulate the 'natural tendencies' of individual electronics capitals. It is, for instance, playing an active part in encouraging the consolidation of indigenous private industries involved in IT, the better to resist overseas competitors. The NEB and the Department of Industry, for example, tried during **1979** to promote a merger of Plessey's telecommunications equipment side with that of GEC, and earlier the NEB had attempted to persuade STC to merge with Plessey. In addition, there were no stumbling blocks put up to recent GEC, Racal and Thorn takeovers.

Without state involvement the British IT industry would certainly be in danger of collapse. The public sector, for example, absorbs about one third of British computer capacity while under a preferential procurement policy almost all government computer orders worth over **£100,000** are awarded to ICL. Elsewhere, we find that Plessey achieved **39** per cent of its total sales in **1979-80** to the Post Office and government departments. And, commenting recently on the sale of a **£2.3** million satellite communications station to Nepal, a GEC representative conceded that but for the push from British Telecom's initial orders 'GEC wouldn't be in that business'. The major sponsor of the electronics industry—as in the case of all advanced capitalist countries—has, of course, been the Ministry

of Defence.<sup>32</sup> Very significant elements of Racal, Decca, GEC, Thorn-EMI, Plessey and Ferranti are constituted by the British market for weaponry.<sup>33</sup>

The Conservative government has been reluctant, however, to extend state involvement beyond these 'traditional' responsibilities. Nonetheless, whilst it may be ideologically inclined towards free enterprise it has not been able in practice to fully repudiate the 'French model'. A measure of its present dilemma may be seen in its ambivalent attitude towards the Post Office the splitting of which in 1980 to free telecommunications from the postal services was a sign of government recognition of communications' importance for IT. While this action—along with the 'privatisation' of various aspects of British Telecom's monopoly such as supply and maintenance of terminal equipment—has been interpreted by some as part of the government's 'free enterprise' strategy (which it is), and as the 'denationalisation' of an institution established by the state, it remains a fact that the government has left the monopoly over the basic network intact with British Telecom retaining the monopoly on installation of first telephones, on the maintenance of PABX equipment and with the Department of Industry issuing licenses for suppliers of both equipment and services (effectively giving the minister control over the amount and degree of competition).

The Conservative government's policy of giving rein to private capital is therefore necessarily guarded. Important factors pertaining to the strategic nature, and the size and potential impact of IT, make it difficult for any state to extricate itself. In the light of the concerted programmes being drawn up in France and Japan, it is difficult to see how a strategy fully committed to 'free enterprise' could really serve the long-term interests of capital in the UK.

### *Conclusion*

An aim in this article has been to take consideration of IT out of what we feel has been an overly economic and technical forum of debate and to begin to situate it in the context of broader social relations of contemporary capitalism. In what has been a deliberately wide-ranging discussion we have sought to explore three major areas that should be of concern to socialists. Firstly, we have argued the need to take seriously the current wave of futurism that popularises IT: it represents a significant phenomenon and threatens to set the terms of popular debate. Secondly, we have stressed the importance of focusing on the real forces behind the 'information revolution'. It is essential to document, to publicise and to criticise the activities of the powerful multinational corporations that are now monopolising the IT sector and shaping innovation as an expression of the needs of capital. Finally, we have sought to indicate ways in which IT is centrally implicated, outside the USA, in a process of increasingly corporatist capitalism.

At present this article can only be a tentative exploration of what appear to be significant tendencies in the development of capitalist societies. Nonetheless, IT is being constituted, not as a liberating technology, but as one that will facilitate the institution of the rule of capital across ever wider spheres of social existence. The extensive influence of this new technology will be felt not just in the workplace (through the discipline of the labour process) but beyond—in both the public sphere (as a tool of administrative and political processes) and the private sphere (through the further **privatisation** of leisure). Information technology is deeply implicated within the process of planning and integration that is increasingly co-ordinated by the state in alliance with large corporations. It is this process of capitalist centralisation and concentration that lies behind that aspect of the post-industrial ideal that focuses upon a planned, administered and technocratic organisation.

However, Daniel Bell refers to another aspect of futurist aspirations: the tendency towards decentralisation. For him, 'the revolution in communications allows for a large diversity of cultural expressions and the enhancement of different life-styles. . .', for a situation in which 'individuals can create their own modes of communication and their own new **communities**'.<sup>34</sup> In this observation Bell does locate a significant phenomenon, but in posing centralisation/decentralisation as alternatives he in fact obscures their inextricable inter-relationship in capitalist society. Decentralisation will develop as an aspect within a centralised and integrated structure. We are convinced that parallel with increased centralisation of state apparatuses and corporations will develop decentralisation, this latter being a tendency which will encourage the trend towards privatisation, especially with consumer goods and entertainment (video games, video discs, home computers, etc.), but extending even further.

There are signs within advanced capitalist society of disenchantment with that phase of accumulation built upon mass production and mass consumption as a way of life. Michel Aglietta and Monique Fouet have pointed to

**the questioning of repetitive work, the failure of the 'great society' to attenuate discrimination concealed within the mode of consumption, the appearance of a social awareness of inequality and of militant movements aiming explicitly to equalise living conditions, the exposure of the waste of natural resources. . . All these constitute so many factors dissolving the previous logic of growth. . . and provoking serious conflicts that fail to respect traditional social divisions.**<sup>35</sup>

Aglietta and Fouet argue that we are ~~now~~ witnessing a 'general transformation of the mode of growth': the formation of 'a new coherence of social production' that points to a more flexible and decentralised phase of accumulation. This theme is taken up by Norman Macrae of the *Economist* in an article that pronounces the demise of 'the Henry Ford manufacturing

age<sup>36</sup> and looks to greater decentralisation of work and leisure. This would entail the growth of parcellised and disseminated labour processes. In the longer term, for example, Macrae envisages the growth of homeworkers 'telecommuting' via domestic data-processing terminals—precisely the scenario set in Peter Large's futuristic *The Micro Revolution*. It also facilitates the individualisation of consumption, the provision of tailor-made (and Taylor-made) consumer goods: 'custom-built production at mass-production prices'. For Macrae 'the place where the world is going to is called consumers' freedom'. We see it as the increasing fragmentation of work and leisure activities alongside the concentration of the power of our rulers.

## NOTES

Defined by UNESCO as 'The scientific, technological and engineering disciplines and the management techniques used in information handling and processing; their applications; computers and their interaction with men and machines; and associated social, economic and cultural matters'.

See C. Jenkins and B. Sherman, *The Collapse Of Work*, Eyre Methuen, 1979; C. Harman, *Is a Machine After Your Job?* SWP, 1979.

T. Stonier, 'The Impact of Microprocessors on Employment', in T. Forester (ed.), *The Microelectronics Revolution*, Oxford, Blackwell, 1980, p. 305.

4. C. Evans, *The Mighty Micro*, Coronet, 1980, p. 94.

5. cf. D. Bell, 'The Social Framework of the Information Society', in T. Forester (ed.), *op. cit.*; A. Smith, *Goodbye Gutenberg*, New York, OUP, 1980.

cf. C. Evans, 1980, *op. cit.*; A. Burkitt and E. Williams, *The Silicon Civilisation*, W.H. Allen, 1980; A. Hyman, *The Coming of the Chip*. New English Library, 1980; P. Laurie, *The Micro Revolution*, Futura, 1980; P. Large, *The Micro Revolution*, Fontana, 1980.

7. D. Bell, *op. cit.*, p. 501, 509.

8. J. Martin, *The Wired Society*, Englewood Cliffs, Prentice-Hall, 1978, p. 4.

9. D. Bell, 'Communications Technology—For Better or For Worse?', *Harvard Business Review*, May-June, 1979, p. 36.

B. Maddox, *Beyond Babel: New Directions in Communications*, Deutsch, 1972, p. 18.

Quoted in E. Barnouw, 'The Wired World of the Future', *Economic Impact*, 18, 1977, p. 7.

12. Quotations from A. Smith, 1980, *op. cit.*, p. 322, 303.

13. R. Williams, *Television: Technology and Cultural Form*, Fontana, 1973, p. 151.

14. Hitachi, *Annual Report*, 1980.

15. Philips, *Annual Report*, 1979.

16. Directors' report, *GEC Ltd Report and Accounts*, March 1980.

17. Racal Electronics Ltd, *Annual Report and Accounts*, March, 1980.

18. Chairman's statement, *Report and Accounts*, Thorn-EMI, March, 1980.

19. *Thorn-EMI 1980*, Thorn-EMI, 1980.

20. *Report and Accounts*, Plessey Co. 1980.

21. *Bell Telephone Magazine*, (58), 2-3, Spring-Summer, 1979.

22. An alternative strategy for capital—and one that could bring it into conflict with a state fighting to strengthen indigenous capital 'in the national interest'—is, of course, to invest outside the nation state, wheresoever most profits are

available. GEC's major new investments in IT, for example, are in the USA.

23. S. Nora and A. Minc, *The Computerisation of Society*, Cambridge, Mass., MIT Press, 1980.
24. D. Gordon, 'Capitalist Efficiency and Socialist Efficiency', *Monthly Review*, 28, 3, 1976.
25. *Micro-electronics*, Labour Party, 1980.
26. R. Miliband, 'A State of De-subordination', *B.J.S.*, XXIX, 4, 1978.
27. *News From France*, 6, 3, December 1979, p. 8.
28. See Y. Masuda, 'A new development stage of the information revolution', in *Applications of Computer and Telecommunications Systems*, Paris, OECD, 1975.
29. J. Hirschmeier and T. Yui, *The Development of Japanese Business, 1600-1973*, Allen and Unwin, 1975, p. 264.
30. J. Halliday and G. McCormack, *Japanese Imperialism Today*, Penguin, 1973, p. 165.
31. cf. K. Joseph, *Reversing the Trend*, Rose Books, 1976.
32. cf. A. Mattelart, *Multinational Corporations and the Control of Culture*, Hassocks, Harvester, 1979.  
It has been estimated that 20 per cent of the revenue of British electronics firms comes from such sources.
34. D. Bell, 1979, *op. cit.*, cf. Nora and Minc, 1980, *op. cit.*
35. M. Aglietta and M. Fouet, 'Les Nouvelles Perspectives du Capitalisme Américain', *Economie et Statistique*, 97, February 1978, p. 30.
36. N. Macrae, 'The Coming Entrepreneurial Revolution: a Survey', *Economist*, 25 December 1976.