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OFFICE AUTOMATION IN MALAYSIA; THE CASE OF THE TELECOMMUNICATIONS INDUSTRY

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Table of Contents

List of Tables

OFFICE AUTOMATION IN MALAYSIA: THE CASE OF THE TELECOMMUNICATIONS INDUSTRY[1]

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The explosive and dramatic emergence of information technology, aptly termed as the second industrial revolution, has been singled out as the biggest and fastest growing industry in the global economy.[2] It has been estimated that the world market for information technology (henceforth IT) amounted to US$2 trillion in 1990, and is expected to grow at more than eight per cent over the next few years (Wong, 1990). Although initially dominated by the West, many countries all over the world, assisted by government intervention and support, are clamouring to compete and profit from this new technology.[3] Malaysia is no less involved in this global race, in her desire to become a Newly Industrializing Country (NIC) by the end of this century, and to be 'developed' by the year 2020. Nowhere are science and technology stressed more than in the industrial and services sectors, whereby the development of information technology is envisaged to provide the competitive edge to project Malaysia into the 21st century.

This paper focuses on the impact of office automation in the tertiary sector in Malaysia, the main user of IT in the country. It addresses IT issues related to skills, employment, changes in work organization and health and safety. A case study of the telecommunications industry will be utilized to illustrate the impact of IT on office workers, with particular attention on women workers who form a substantial proportion of the clerical labour force in the country. Where relevant, examples will be provided of case studies in the airline and public sector.

A. Information Technology, Office Work and Gender: A Conceptual Framework

The literature on the impact of new technology, office work and gender in Western Europe and North America exhibits variations as well as contradictions in theoretical approaches and empirical analysis. In the developing countries, there is hardly any empirical research being conducted and thus we have considerably less than a complete view of IT and its interconnections at the national, regional and global level. Nonetheless, in attempts to understand the impact of this new technology several major themes have emerged - that of capitalism and postindustrialism, while a feminist critique is being formulated, based on criticisms of both feminist and non-feminist work. These approaches take different positions on key issues such as the skilling/deskilling process, employment displacement or creation, and the effect on women's (reproductive) health.

Skilling or deskilling?

Clearly controversial, the seminal work of Braverman's *Labour and Monopoly Capital* in 1974 has stimulated a series of debates on whether the logic of accumulation in capitalist production is inexorably to deskill the labour process, producing degraded, routine, fragmented work processes in manual as well as non-manual labour. Although his work focuses on the deskilling of manual labour in the manufacturing sector, Braverman also argues that non-manual labour - particularly clerical work - is becoming progressively deskilled. Control is being lost through the separation of 'conception' and 'execution' tasks through Taylorism which rationalizes office work through mechanization and eventual computerization, removes skill and increases the power of the office manager. Those following his line of argument point out that IT has to be understood in this light - subject to the forces of capital accumulation. As noted by two authors,

> It is within this overall context that we must view the introduction of word processors and other microelectronically based office equipment into offices - not as part of a technology which is autonomous, driving itself forward by its own momentum, but related to and crucially part of capital's strategy to continually reproduce itself. (Barker and Downing 1980:85, quoted in Webster, 1988)

Feminists who agree with Braverman point out that technology is a social process shaped by the political economy, and that choices are made within the context of a capitalist society reflecting the larger social forces in that society. Particular technologies have been, and will continue to be developed primarily based on the interests of capital. In so far as the unequal gender division of labour exists, they discuss how women's work in clerical jobs becomes more fragmented and isolated, their output highly monitored and their pace and stress of work increased. Thus computers support the capitalist system by moving information and skills from workers to managers, and reinforce patriarchy by pushing women into low-skilled, low-paid and highly controlled work. And where there is ethnic disparity the increased usage of computers tends to intensify stratification along racial lines too (Armstrong, 1984; Perry and Greber, 1990; Shibayama, 1987).

On the other end of the 'deterministic' spectrum are the arguments that technology has brought or will bring positive benefits in this postindustrial, informatics age. This is the so-called 'paperless' office in which work is seen as being more skilled and satisfying for the office worker, who is an administrator of information rather than an extension of the machine. In fact the microprocessor compared to older technologies is more flexible, cheaper to produce, with integrative and innovative functions, opening up a new unexplored world. Gone are the days of the assembly line of socialized and centralized production. Thus IT offers possibilities of radical decentralization and less functional

specialization making office work more flexible, creative and inter-active (Albin and Appelbaum, 1988; Baran and Teegarden, 1987).

Feminist critiques of these opposing views have also attempted to formulate their own understanding of IT, work and gender. They point out that these views lack a gender-specific analysis of technological change and fail to analyse adequately the relationship of IT, the social division of labour and the role of the family. It is important to address the problem of why the reproduction of the sexual division of labour has proved remarkably resilient despite technological advancement (Cockburn, 1983, 1985). Some, like Beechey (1982, 1988) and Crompton and Jones (1984) have delved in depth on the work of Braverman, others have accepted both the 'capitalist' and 'postindustrialist' positions (Baran and Teegarden, *op.cit.*), while still others have tried to formulate new questions and understanding.

For example Webster (1988) argues that it is the presence and extent of the technical division of labour rather than new technology that is the significant determinant of task fragmentation, deskilling and work intensification. Based on her research in the United Kingdom, Webster states that there is no one uniform impact of IT on all categories of typing-related office work. She goes further to say that one should celebrate the work and status of the office secretary who has relative freedom and control over her work rather than being critical of her 'feminine' role (1990). Within the same vein Lie (1990), Goodman (1985) discuss the importance of the invisible skills of women clerical workers who undertake 'emotional and care-giving work' which are often not recognized, let alone classified as skills. Office skills, they conclude are not only the visible skills of knowledge of the routines and the work of the firm, but also the ability to interpret questions, combine information of non-routine cases as well as involving abstract and social skills. The study of Pullman and Szymanski (1988) of clerical worker skills in the banking, insurance and legal industries in New York reveals that the ability to 'perform' involves a series of technical, interpersonal, cognitive and experiential skills which are often hidden and associated with many 'women's' jobs. Their data show that with computerization, clerical workers are using new skills and that while technical skills are critical for entry into the clerical world, interactive and abstract skills are key to maintaining jobs in an increasingly automated environment. Recently, Suchman (1990) and Lie (1990) raise questions regarding the symbolic and cultural representation of the computer and whether its characterization is inherently masculine or feminine. Still in its early stages of formulation, this feminist perspective opens up another arena of analysing the gender identity of the computer as an ongoing political, social and cultural construction.

The most trenchant feminist critique of Braverman relates to his conception of skill and deskilling which has implications for understanding the sexual division of labour.[4] Beechey (1982) points out that Braverman's 'notion of skill derives from a conception of the male artisan/mechanic, who is regarded as the 'original' kind of skilled labour, whose skills have been wrenched away from him by the subordination of labour to capital and the separation of conception and execution' (p. 63). This concept of skill has many aspects and she says that it is not clear which aspect of skill he is referring to; whether (i) the concept of skill embodies the complex competencies which can be seen as objective,[5] (ii) it refers to control over the labour process, or (iii) it refers to conventional definitions of occupational status.

According to Beechey, failure to differentiate these aspects leads to an oversimplified analysis that changes in the labour process tends to lead towards deskilling and the degradation of labour. For example, she elaborates that cooking demands competencies and control over the labour process but is not conventionally defined as skilled (except for chefs in the capitalist market), while there are forms of labour which are conventionally defined as skilled, but are not technically complex and do not involve conception and execution, yet they have been socially defined as skilled due to trade union bargaining. Beechey and other critics point out that skills have very much to do with ideological and social constructions as with technical competencies. It is important then to study the historical processes whereby skills have been constructed and why the work of certain groups of people, particularly women, have been associated with unskilled labour. The notion of deskilling has a gendered dimension to it, and studies have shown that the definitions of skill have more to do with the attempts of men, through their control over the trade unions, to retain the designation of skill for themselves, while at the same time excluding women from these and better-paying jobs.

Cockburn (1983, 1985), in her interesting study of the printing and engineering industries, has argued how technology as a medium of power, has led to a trade union negotiation of the definition of technological skills, to the detriment of women. In another useful study on clerical work, Crompton and Jones (*op.cit.*) point out how gender operates as a significant filter in the deskilling process whereby a minority of jobs are defined as being the lowest clerical grade not because of the technical content, but because it is being carried out by women. Women do not have 'promotable characteristics' and have not followed the usual male routes in the acquisition of skill - education, training and apprenticeship in the case of objective skill, and collective bargaining in the case of conventionally defined skill. As a result, other important skills in office work which are inter-personal, cognitive and more human - the emotional work and care-giving work associated with

women - are not recognized and remain hidden (Clement, 1990). In the process women have not had the power to influence the classification of their invisible skills in managing the office, although historically clerical work was a male domain and conceived of as a craft - skilled, close to management and a gentleman's work (Dy, 1985; Frida de Jong, 1989).

It is also important to recognize that capitalist development has brought about new skills. At the office level new departments have been created in relation to planning, finance, personnel and marketing giving rise to a whole spectrum of managerial and supervisory positions. In the process, clerical labour has not been homogenized as Braverman claims, producing a class resembling that of the manual proletariat. On the contrary, there is a tremendous heterogeneity in clerical occupations and one has to differentiate their different aspects in terms of composition, pay, employment opportunities, job content and function. Gender and ethnicity are equally important dimensions. In terms of IT, new jobs have also been created in the form of systems analysts and programmers and other occupations associated with it. According to Crompton and Jones (*op.cit.*) new technology has led to the stratification of the white collar labour force, creating on the one hand a mass of routine, unskilled operations, and on the other a much smaller proportion of relatively skilled jobs. Is it true then, that in this process gender polarization of tasks occur whereby women are at the bottom and men invariably dominate the top high ranking positions?

Displacement or new opportunities?

Data on the impact of IT on employment has been contradictory. Has there been a drastic decrease in employment, particularly of women, as predicted in the wake of new technology with its labour displacing effects? Studies in Canada prophetize that new technology will result in job losses, the most vulnerable of whom will be women workers in the manufacturing and service industries. For example it was predicted that up to 25 per cent of jobs in the business and financial sectors would disappear by 1991 and 200,000 female clerks would be made unemployed in the best circumstances, and in the worst, 750,000 (Armstrong, 1984:150-153).

However, a recent study by Hunt and Hunt (1987) reveals that there was a tremendous growth in clerical employment in the US until the mid-1980s although there has been a reduction in the rate of increase in the proportion of clerical workers to the total labour force. There has been a big increase in the number of computer and peripheral equipment operators (22 per cent annual average rate of growth), although there has been a decrease in stenographers and telegraph operators. They conclude

that office technology cannot be regarded as an important determinant of clerical employment for more than a few occupations and that economic growth is the most important factor in determining clerical employment. Thus prediction of no growth or an actual decline of clerical jobs is wrong. 'High tech and high touch'[6] occupations are both needed in the office of the future which until now has not had as fast a rate of diffusion as popularly assumed.

Although new technology cannot determine the level of clerical employment, as correctly concluded by Hunt and Hunt above, its increased flexibility nevertheless allows for decentralization in the preparation and data entry part of this new technology (Pearson, 1991a). IT has facilitated the creation of more routinized data collection and data processing jobs - jobs undertaken by the suburban housewife with low pay and under conditions of flexibility.[7] Recently such decentralization of particularly data entry work has been internationally relocated to the developing countries. One of the first companies to use these services was American Airlines which established its data entry operations in Barbados in 1984. Other companies followed in using the services of Caribbean countries while in the East, countries like Singapore, India and the Philippines are known to offer such facilities.[8]

To what extent are these jobs of low value and deskilled?

In Jamaica, the vast majority (98 per cent) of data entry workers are women who receive low pay with limited chances of promotion. At the same time it has been argued that there are possibilities of acquiring better skills in this fast-growing industry dominated by local entrepreneurs and for the development of a highly skilled flexible labour force in the information services sector (Pearson, 1991b). In other words, it is not necessary to write off all data entry work as unskilled and synonymous with assembly-line work typical of other free trade zones.

Nor should one say that the higher valued jobs are the exclusive domain of men as studies have shown that women are entering computer professions as managers, technicians and other professionals in both the developed and developing countries. In the US, women make up 32 per cent of systems analysts and 41 per cent of programmers (Lehto and Eriksson, 1990). There are more female than male programmers in both Singapore (58 per cent) and Malaysia (52 per cent), while in Singapore 52 per cent of the systems analysts/designers are women (Lim, 1989). It seems that there is a polarization within the female labour force itself and not just between men and women as is commonly and simplistically declared.

Health and safety in the office[9]

Another major and less controversial issue raised by the advance of IT in the office has been its effects on the health and safety of its users, the main areas of concern evolving around occupational stress and the use of visual display units in the office (Werneke, 1983; Dy 1985). Occupational stress refers to excessive stress or strain caused by a job. If this occurs over a long period, it can lead to a number of serious health problems such as heart disease, ulcers, hypertension and psychological reactions. Eyestrain and muscular problems also contribute to overall stress.

Literature on health and safety in the West has focused on women workers who form the bulk of office workers as typists, cashiers, clerks, secretaries and computer operators. Werneke has pointed out that 'the hazards of office work have a particular impact on women, who are most likely to occupy the most highly regimented jobs, experience the greatest stress, and have the heaviest home responsibilities on top of their duties'. A 1977 study by the United States National Institute of Occupational Safety and Health (NIOSH) found that women clerical workers and secretaries had the highest rate of stress-related diseases, including coronary heart diseases (ICFTU, 1983).

The workers most affected seem to be VDU operators performing routine work who feel more tightly controlled by machine systems compared to a more conventional regulated kind of work. One of the most common complaints by VDU users - especially among data entry workers - is eyestrain. This hazard has become so common that it is almost taken for granted. Common symptoms include puffiness around the eyes, reddened, watering eyes, soreness and irritation, twitching eye muscles, dizziness, burning eyes and headaches. Other reported symptoms relate to visual impairment such as blurred vision, difficulty in focusing and double vision. A Canadian survey of more than 2,000 office workers in 15 workplaces revealed that there was a higher incidence of eyestrain and visual problems in VDU users compared to non-VDU users. Another study of nearly 4,000 VDU operators in Britain disclosed that 70.3 per cent of operators suffered from eyestrain and 48.3 per cent from irritated eyes. The extent to which individual VDU workers suffer from this hazard depends on various factors such as the state of their eyes, characteristics and design of the workplace, the nature of their work and the frequency of breaks (Huws, 1987; Dy, *op.cit.*)

Musculoskeletal problems which arise are mainly related to incorrect posture and strain on muscles due to repeated movement under tension. The main areas of the body affected are the hands, wrists, arms, shoulder, neck and back. According to Huws (1987:50):

> So prevalent is this problem in Japan that the combination of stiffness in the shoulders with stiffness and pain in the upper arms and neck has been known as 'key-punch disease' and, after a protracted struggle by some of the women workers, is now officially recognized as an industrial disease entitling the worker to compensation.

Diseases in this group are often known as repetitive strain injuries or RSI. An example is tenosynovitis or 'teno', which is an inflammation of the sheath surrounding the tendons of the hands, wrist and forearm. This condition is caused by rapid, repetitive finger and hand movements and has been observed among assembly line workers, and recently among journalists, keyboard and cash register operators. Apparently it has now replaced backache as the 'biggest single cause of time off work in the West' (Perera, 1991).

Another serious problem faced by VDU workers relates to conception, pregnancy and birth. Although there is no conclusive evidence and insufficient information of the relationship between the exposure to x-radiation and abnormal births, a survey by Sohyo (the General Council of Trade Unions in Japan) found that among VDU workers who carried to the full term, 36.4 per cent experienced abnormal deliveries. In fact those who worked for longer periods without breaks have a higher chance of having an abnormal birth (Hiroko Shiga, 1987). However, the results of a recent study of 3,711 VDU users and women's reproductive health contradicted the above conclusions by maintaining that:

> These results therefore offer some reassurance to VDU users that their work is not affecting their chances of having a happy and successful pregnancy either directly or indirectly, immediately or cumulatively. (Bramwell and Davidson, 1991)

To recapitulate, studies which try to reflect the issues discussed in the previous sections have produced conflicting results, some consistent with those aligned with Braverman, while others tend towards the postindustrialist argument. Feminist writings or studies on gender and IT are also inconsistent on whether women are excluded from the new jobs created by IT.[10] IT can create or displace employment. It can relegate clerical work to tedious and repetitive jobs and it can afford innovative work and create new skills. It can fragment and control work and workers and it can broaden and allow more autonomy. The computer-rationalization of production can be robust and more democratic, or algorithmic and more authoritarian (Albin and Appelbaum, 1988).

Struggles by office workers in Canada, France and Mexico reveal that the flexibility of IT can allow for worker participation in the design of information systems (Clement, 1991; Ormos and Blameble, 1989). Strong trade union demands coupled with a more open government (e.g. in the Scandinavian countries) can provide channels for participation from all levels of office staff in the planning of

technological change. Feminist computer professionals are already combining participatory principles in the design of systems (Greenbaum, 1991).

In discussing the impact of IT on office work, various factors have to be considered, besides the overriding vision of a technologically determined future or the dominating will of capital accumulation. First one needs to look at the particular existing social, economic and political forces and how relations at work reflect such forces. Given a society based on hierarchy, if technology is a medium of power, then one needs to understand how that power is being negotiated. This means that de-skilling and intensification of work are by no means the logical conclusion, the inevitable consequence of technological change. Nor does this mean its opposite, that technology will also automatically create new and better opportunities.

As Baran and Teegarden put it, office automation cannot be analysed as a unitary phenomenon. It needs to be situated in a context of the specific existing social relations and organization of work, the impact of which can vary based on the type of machine being installed, the period of installation and the existing labour processes which are being automated. Moreover different levels of office workers are differentially affected and that means a study of all levels of staff, including its gender and ethnic composition, besides the present focus on clerical staff, which is often undifferentiated. I would agree with Webster that:

> Far from WP having one uniform impact on all categories of typing-related office work, several different labour processes result, from highly integrated jobs containing a variety of whole tasks to tightly fragmented ones, made up of partial operations.

To illustrate the above framework, let me turn to a discussion of the Malaysian case.

B. Information Technology in Malaysia

Malaysia's joining of the newly industrializing bloc of nations requires the industrial sector to be the driving force stimulating the growth of the economy. According to Prime Minister Dr. Mahathir Mohamad, by the year 2020 Malaysia aspires to become a 'united nation, with a confident Malaysian society, infused by strong moral and ethical values, living in a society that is democratic, liberal and tolerant, caring, economically just and equitable, progressive and prosperous, and in full possession of an economy that is competitive, dynamic, robust and resilient' (Government of Malaysia, 1991).

In addition, Malaysia plans to be an important South East Asian financial centre and a regional media and distribution point. As one of the leading members of the Association of Southeast Asian Nations (ASEAN), Malaysia also hopes to benefit from the current strong economic growth of the ASEAN bloc. In order to maintain this growth, ASEAN leaders are fully aware of the need to pursue actively a campaign to promote the computer and telecommunications industry as part of their national development policies. According to Lent (1991), significant developments have occurred in telematics in the ASEAN countries so that they have been touted as the showcase for successful modern communications in the Third World.

It has been said that the momentum towards making Malaysia a NIC has been spurred by two policy decisions formulated during the early Mahathir rule - that of the 'Look East' and Privatization Policies. As a result of these two policy decisions, there have been major transformations in the economy.[11] The 1983 'Look East' asserted the need for Malaysians to emulate Japanese and Korean work habits, pre-requisites towards moulding an industrial workforce for rapid economic advancement. More importantly, this policy led to a liberalization of the economy which opened wide doors to Japanese and Korean investments. At the same time, in line with World Bank advocacy of global privatization, Mahathir announced Malaysia's own privatization policy in 1983. This policy emphasized the increased role of the private sector in the development of the economy and saw a reduced role of public sector involvement.[12] Deregulation was introduced to increase foreign investment and to stimulate growth.

Malaysia's adherence to World Bank recommendations has been praised by the latter and Malaysia has been heralded as the showcase among developing countries, being singled out as one of the few countries in the world to have successfully carried out adjustment programmes in the early 1980s. Indeed, despite the traumatic recession experiences in 1985-86 (where growth rate was a negative one per cent), the economy has bounced back, registering a 10 per cent growth rate in 1990.

To achieve this industrialized cum developed status under 'Vision 2020', the establishment of a National Science and Technology Policy in 1986 has been considered a major milestone in the development of a scientific and progressive society 'that is not only a consumer of technology but also a contributor to the scientific and technological civilisation of the future' (Government of Malaysia, ibid). And in the recently unveiled Sixth Malaysia Plan (1991-1995), information technology has been singled out as one of the five key technology areas to pitch Malaysia as a developed country into the 21st Century.

Thus IT is perceived as having the potential to push Malaysia into becoming an information society which will help and support an industrial culture needed to sustain industrialization. Accordingly, for Malaysia to be successful in this highly competitive field, she must develop a productive and highly skilled labour force which, according to the Outline Prospective Plan 2 (OPP2 1990 - 2000), should have positive values and attitudes such as integrity, discipline, punctuality, diligence and must be hard-working and cost-conscious.

The promotion of IT in the country led to the establishment of the National Committee on Data Processing (NCDP) with the objective of formulating a national computer policy that will ensure the promotion, coordination and control of the usage of computer technology most effective for modernization. Other objectives included the promotion of the local computer industry as well as the training of professionals in the field and the promotion of research related to computer technology and services (Mohammad, 1987). Within the government sector, the Manpower Planning Unit (MAMPU) under the Prime Minister's Department is responsible for making plans to improve management systems and the utilization of electronic data processing equipment in government agencies. Another important development was the establishment of the Malaysian Institute of Microelectronics Systems (MIMOS) under the Prime Minister's Department in 1985 to conduct research, provide training and to explore the potential of microelectronics to local industries (Tengku Azzman et al. 1991). At the private sector level, the Association of the Computer Industry of Malaysia (PIKOM) has actively lobbied, through seminars and exhibitions, for increased computer usage in the country as well the deregulation of the computer industry in Malaysia.

As a result of all these encouragements, the computer industry has become one of the fastest growing industries in Malaysia, with the biggest users in the financial sector, followed by business services and the government sector. The manufacturing sector accounted for 13 per cent of total computer usage. Its market size more than quadrupled from 1978 to 1987, i.e. from M$130 million to M$560 at an average per annum growth rate of 21 per cent.[13] According to the Chairman of PIKOM, the 1991 growth rate of the industry was estimated at 33 per cent (STAR, February 8, 1991). The 1987 Asian Computer Directory listed Malaysia as the fourth largest user of computers in Asia, after Japan, Singapore and Hong Kong.

According to the Asian Computer Weekly, the number of mainframe/minicomputers installed in the country increased from 625 in 1982 to 916 units in 1986, with the public sector accounting for one-quarter of the total number of installations in 1986. In addition, the increase in usage of

microcomputers (PCs) has been tremendous over the last few years - from 3,500 before 1984 to over 82,000 in 1986 in the private sector alone. It has been estimated that the market size for microcomputers and peripherals is about $100 million annually.

The growth of the IT industry has led to a proliferation of companies and computer business related activities. By 1986, there were 355 vendors in Malaysia, the biggest being IBM, and more than 550 companies in the computer industry. Many of these companies trade in micros and peripherals. The government is also encouraging the development of the software industry which has a present market of $100 - $150 million per year. There are over 100 companies engaged in software sales and more than 30 systems/software houses in Malaysia. The local computer industry is mainly staffed by locals, although subsidiaries of foreign computer manufacturers dominate the top 10 vendor companies in terms of revenue and staff.

As noted earlier, the public sector has also developed its computerization programme rather rapidly in the past few years. Acquisition of mini and mainframe computers has increased from 3 in 1966 to 226 in 1986, while the number of microcomputers proliferated to 8,000 units in 1989. From 1977 until 1988, the government spent about M$490 million on the purchase of computer systems. For 1989 alone, the government approved another M$158 for computerization projects. Computer applications have also grown more sophisticated. According to a government report,

> In the early 1970s, public sector data processing facilities were mainly used for routine functions like accounting, payroll and personnel. The mid-70s marked the emergence of management information systems in the areas of personnel administration, agriculture, land administration and finance. Networking and distributed processing started around mid 1980s ... Beyond the 1990s, it is expected that more emphasis will be given to the development of integrated databases in which data will be treated as a corporate resource ... The provision of the "state of the art" telecommunications services which are more reliable and cost-effective would promote the climate for more extensive networking and distribution of databases.[14]

Information systems such as SETIA and SMPKE have also fuelled the rapid advancement of the computer industry in the public sector. SETIA is a government agency launched in 1984 to function as an integrated information system used by government agencies to plan and coordinate development projects. SMPKE or the Chief Executive Management Information System is used to computerize the collection and dissemination of important decisions of different Ministries and government departments. In addition, the government has also given a big push in establishing an advanced computer network as well as the use of microcomputers in computer education. The establishment of RangKom, JARING and CIE are a few examples.

In June 1987, a computer network called RangKom (Rangkaian Komputer Malaysia) was launched to facilitate electronic mail services within the country and with five major international gateways - USA, Netherlands, Australia, Indonesia and Korea. As a result JARING (Joint Advanced Research Integrated Networking) could be launched in 1990 offering new data communications facilities to academic institutions, research institutes, libraries and several public sector organizations. JARING is expected to play a major role in promoting education and cultural values through a proposed nation-wide educational computer network. Computer literacy is also reaching schools as seen by the CIE (Computers in Education) programme which aims to introduce computers in education to primary and secondary schools. Initially introduced to 1,400 secondary schools, the next phase is expected to cover the primary schools.

It can be clearly seen that the Malaysian state is keen to steer Malaysia into an increasingly industrialized path by providing various incentives to private capital interests to invest in the country. There has been a distinct shift from public sector participation in economic development towards privatization of the economy. In this respect, IT has been given a key role in supporting the transformation of the economy. What has been the impact then on the level and nature of employment in Malaysia?

C. Occupational Structure and Change Under It

It has been popularly claimed or believed that automation will eliminate jobs, with the coming of the robotized office and factory floor. Studies in the industrialized countries have shown that the micro-electronic revolution has led to a loss of jobs in certain key industries and services in Western Europe (ILO, 1982:104). However the data in Malaysia point out that this concern has to be treated with some caution, and that the impact of IT on employment is not homogeneous, and has to be seen in context. To be sure, the period of expanding automation also saw a general expansion of the clerical work force due to the rapid growth and structural change of the Malaysian economy as discussed in the earlier section.

As can be seen from Table 1, employment in the clerical and related group more than doubled within the period from 1975-87. A few patterns emerge. First, there is a dramatic growth in occupations associated with computerization. For example, systems analysts grew more than twelve-fold (from 172 to 2177), computer programmers more than nine-fold (from 335 to 3185) and automatic data

processing machine operators increased more than six-fold (from 1038 to 6869). Second, there is a decline in jobs that are displaced by the computer such as card and tape-punching machine operators and book-keeping and calculating machine operators. Third, the number of clerical jobs more than doubled, probably as a result of the expansion of the public and business sectors, although this growth was disproportionate to the number of clerical supervisors and executive officials who increased more than three-fold, suggesting a need to have more management control over workers, as automation with larger capital investments demanded more productivity per worker.

Fourth, jobs become more differentiated with the changes and dynamism in IT. Some jobs change and expand, others become more defined and specialized, particularly in the more technical, higher paying fields. A recent newspaper report quoted an estimate from the Economic Planning Unit of the Prime Minister's Department that 26,485 EDP personnel needed to be trained for the period 1990 to 1995. These job areas include systems programming, software specialist, data communications/ networking, computer security, hardware maintenance, management information system, and systems integration (STAR, 8 February 1991). Already the private sector is facing a serious manpower shortage and is clamouring for 'critical' personnel from analysts, programmers and system designers to datacomm engineers and cellular technologists.

Fifth, changes in gender composition reveal some interesting patterns. The higher paid more technical occupations (systems analysts) are overwhelming male dominated, as are the supervisory and the executive positions. However, it is interesting to note that there are slightly more female than male programmers, pointing to the opening up of opportunities for women in the computer professions at this middle level. Gender polarization is also evident in the jobs which are overwhelmingly female - data entry operators, stenographers, typists and clerks. In fact there has been a shrinking of male intake in these categories over the years, although traditional male clerical occupations like bookkeepers and stock clerks are still male arenas. While the gender segregation is not so clear-cut, there seems to be a trend for the higher technical and management personnel to be male-dominated, the middle level to be gender neutral, while at the clerical level, the expansion is increasingly female, at the expense of men. However, the creation of new jobs at the higher level do not seem to benefit the (female) workers displaced by automation, as a new breed of specialized graduates, mainly male, are brought in, creating a new stratum in the office.

Table 1 Peninsular Malaysia: Employment by Selected Occupations and Sex - 1975, 1985 and 1987

Occupation	1975			1985			1987		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Group 1 - Professional, technical and related workers									
Statisticians 2	45	71	316	97	n.a.	97	47	103	150
Mathematicians & actuaries	n.a.	n.a.	0	n.a.	n.a.	0	93	n.a.	93
Systems analysts	91	81	172	903	492	1395	1770	407	2177
Computer programmer & stat & math tech	335	n.a.	335	1231	1051	2282	1529	1654	3183
Group 3 - Clerical and related workers									
Clerical supervisors	5011	419	5430	7643	2150	9793	15054	4665	19719
Govt executive officials	13948	1388	15336	36812	6157	42969	36241	7362	43603
Stenographers, typists & teletypists	4220	22962	27182	3663	47439	51102	2485	47351	49836
Card & tape-punching machine operators	336	768	1104	198	557	755	199	376	575
Bookkeepers, cashiers & relative workers	28017	21008	49025	43444	70764	114208	37889	70571	108460
Bookkeepers, cashiers & relative workers NEC	2665	710	3375	1974	2425	4399	1928	2570	4498
Bookkeeping & calculating machine operators	226	1285	1511	88	157	245	212	348	560
Automatic data processing machine operators	91	947	1038	1165	3525	4690	2098	4762	6869
Stock clerks	16542	1401	17943	39250	8105	47355	36606	8015	45621
Material & production planning clerks	80	258	338	1068	624	1692	485	815	1300
Correspondence & reporting clerks	40983	26854	67837	58341	103548	161889	59478	110771	170249
Receptionist & travel agency clerks	521	2661	3182	2425	7469	9894	2348	6009	8357
Library & filing clerks	1185	617	1802	2995	1985	4980	2992	1893	4885
Statistical clerks	n.a.	n.a.	0	661	451	1112	346	499	845
Census, market research and related field workers	n.a.	n.a.	0	1833	530	2363	1395	317	1712
Clerks NEC	14856	3611	18467	16911	10203	27114	18200	8141	26341
Total	**129352**	**85041**	**18467**	**220702**	**267632**	**488334**	**222395**	**276629**	**499024**

Source: Department of Statistics: *Labour Force Survey* (Unpublished Data)

D. The Telecommunications Company in Malaysia (TELMAL)[15]

TELMAL, the telecommunications agency in Malaysia, was established in 1948 under the Ministry of Posts and Telecommunications with the dual functions of telecommunications operations and the supervision of such operations. With the structural transformation of the economy and the move towards privatization as discussed earlier, TELMAL was incorporated as a company on the first of January 1987 and became a Public Listed Company in October 1990, with 20 per cent of its shares open to the public. From a few hundred staff in the beginning, TELMAL grew to its present strength of 28,015, at both the executive and non-executive level. The organizational structure consists of eight main sections sub-divided into 37 units and regions serving 1.3 million customers throughout the whole of Malaysia.

Telephone and telex services are the basic services provided by TELMAL. The others include voice communication, text communication, radio communication and data communication with a view towards more modernized and advanced services in line with the information technology plans of the government. The overall growth of telecommunications services in Malaysia can be seen in Table 2 below.[16]

Table 2
Telecommunication Services in Malaysia 1980-90

Programme	1980	1985	1987	1990
Subscribers				
Telephone	315,640	958,598	1,131,719	1,637,000
Telex	3,878	10,881	11,228	13,000
Exchange capacity				
Telephone	665,035	1,758,260	2,362,696	2,620,600
Telex	4,970	13,020	22,700	22,700
Waiters				
Telephone	133,606	182,641	84,526	50,000
Telex	1,058	1,090	347	390
MAYPAC*	—	87	494	7,000
ATUR**	—	4,630	17,411	40,000

* Malaysia Packet Switched Public Data Network

** Automatic Telephone Using Radio

Source: Syarikat Telekom Malaysia Berhad: Status of Computerization (n.d.)

Computerization and corporatization

In early 1991, *Computimes*, the Information Technology Section of the *New Straits Times*, one of the two main English daily newspapers in Malaysia announced that TELMAL planned to spend more than '$5 million on personal computers, printers and application software in a move to increase the productivity of its staff'. Underlying the recent intensification of computerization is of course the corporate designs and goals of TELMAL as stated in the 1989 Annual Report whereby 'the customers' appetite for service is itself a new business opportunity'. Included in the new corporate image is the emphasis on cost control, efficient use of resources, and the remoulding and nurturing of a new mental and commercial outlook in employees at all levels. The ambitious plans to automate and computerize information systems 'with a view to improving operations, management and decision making' have to be seen in this context - a strategy to 'sustain orderly growth' and profits in relation to the services provided.

Although TELMAL embarked on computerization in the early 1970s, its applications until the mid-1980s were mainly in the areas of telephone and telex billing, telegraph data accounting, store control and inventory system, staff record and payroll system and financial accounting and management systems. As mentioned earlier, it is only in the past six years that there has been major upgrading and development of new systems to provide more functions and utilize more up-to-date technology. This includes designing and developing an integrated customer service order system; and upgrading the billing system, financial management system, human resource management system, material management system, corporate and marketing information system, and areas of technical and network operations.

However, despite the attempts to computerize, the actual rate of diffusion is not very high, and its usage not very extensive at the office level. In my survey sample of 340 respondents (239 female and 101 male), the usage of computers 'most of the time' in their office tasks ranged from a high 72.5 per cent to as low as 6.3 per cent.[17] The female respondents seem to spend more time at the computer. About 14 per cent of them and 23 per cent of the males used computers from between 1-4 hours a day, while 70 per cent of the female respondents used computers from between 5-8 hours a day compared to 53 per cent of the male respondents. A similar situation exists in the Malaysian airlines company MANAS, privatized in 1985. Although MANAS started computerizing in the early 1970s, it only introduced personal computers in the mid-1980s, while integrated computerized systems

were developed recently. The table below shows the ranking of the importance of each task to male and female respondents and the level of computer use at TELMAL.

Table 3
Ranking of Tasks and Computer Usage of TELMAL
Female and Male Office Workers

Tasks		Use computer most of the time (%)
Female Respondents		
1.	Directing mail and telephone messages	60.0
2.	Read letters or inquiries	50.9
3.	Process and maintain records	53.0
4.	Data entry	72.5
5.	Information gathering	42.3
6.	Write original materials	52.9
7.	Statistical computation	51.5
8.	Text input	56.5
9.	Filing	9.4
10	Write standard materials	51.7
11.	Spreadsheet	72.5
12.	Prepare charts, diagrams	65.6
13.	Money handling	55.6
14.	Billing	52.8
15.	Create a filing system	22.6
16.	Fill in forms	11.3
17.	Production control	30.0
18.	Proofread/edit	35.3
19.	Develop forms	49.1
20.	Bookkeeping	30.0
Male Respondents		
1.	Process and maintain records	59.8
2.	Data entry	64.6
3.	Information gathering	41.4
4.	Write original materials	41.0
5.	Prepare charts, diagrams	45.7
6.	Statistical computation	50.8
7.	Production control	34.8
8.	Write standard materials	42.4
9.	Billing	56.0
10.	Spreadsheet	55.1
11.	Money handling	56.0
12.	Support services	14.0
13.	Filing	7.8
14.	Proofread/edit	28.6
15.	Bookkeeping	45.0
16.	Read letters or enquiries	-
17.	Directing mail and telephone messages	6.3
18.	Text input	19.8
19.	Fill in forms	7.7
20.	Develop forms	33.3

Computerization and employment

As of October 1990, there were 28,015 employees at TELMAL compared to 28,168 in 1988 and 28,041 in 1989. This means that there has been a slight reduction in staff (154 fewer) despite the expansion of its services, customer base and the substantial increase of profits through the years.[18] The next question is, to what extent is the gender division of labour affected? It is not possible at this point to look at the changes in employment by gender due to the absence of data over time. What I have is the 1990 records which disclose that the 6,730 women employed comprise 24 per cent of total staff at TELMAL. Five per cent of the total staff are in the executive category, out of which 29 per cent are female. This means that 6.1 per cent of total females are in the executive category compared to 4.8 per cent of all males, quite an unusual pattern in the Malaysian context. However on closer examination, most if not all of the top decision-making positions of senior managers and directors are male dominated. Malays form 74 per cent of total staff. Table 4 shows the distribution of non-executive employees by gender followed by a breakdown of computer-related occupations.

Table 4
Distribution of Non-Executive Staff by Gender: TELMAL

Category	Male	Female
Non-executive jobs		
Technical	7,936	1,272
Clerical	1,437	2,560
KPBK	6,627	161
Teleprinter	38	291
Telephonists	694	1,398
Sub-Total	**16,732**	**5,682**
Computer-related jobs		
Systems analysts	117	38
Systems programmers	37	24
Computer operators	42	23
Data processing machine operators	12	117
Sub-Total	**208**	**202**

To a large extent, the gender composition at TELMAL reflects the pattern at the national level in which the decision-making tasks at the executive level are dominated by men, particularly at the very senior management and director levels. The technical slots are also the domain of men while the women crowd around the data-entry, clerical and telephonist occupations. While there is an equal number of men and women in computer related jobs, the majority of women are lower-level computer operators or data entry workers. It is only at the level of systems programmers that women seem to compete; however the main decisions regarding computerization remain with systems analysts, three-

quarters of whom are men. With the setting up of four data centres, there has been an expansion of higher level computer occupations. However the present intake consists of 'outsiders' rather than through internal promotion. The more than 40 data entry operators who will be deployed elsewhere later will never be able to enter these more technical occupations.

If one compares TELMAL with the airlines company the gender composition is similar in some respects, but also differs in others. Table 5 describes the distribution of the occupational categories and computer-related jobs in MANAS.

Table 5
Distribution of Occupational Categories: MANAS

Category	Male	Female	Total
Occupational categories			
Managerial	110	18	128
Executive	526	124	650
Graded (E to A)	10,509	3,376	13,886
Total	**11,145**	**3,519**	**14,664**
Computer-related jobs			
Senior systems analyst	18	8	26
Systems analyst	28	37	65
Senior systems programmer	13	11	24
Systems programmer	14	11	25
Senior programmer	4	2	6
Computer programmer	23	7	30
Computer systems supervisor	–	1	1
Senior systems operator	3	3	6
Systems operator	14	11	25
Computer operator supervisor	–	2	2
Computer operator	–	2	2
Keypunch supervisor	–	1	1
Keypunch officer	–	1	1
Keypunch operator	–	6	6
Terminal operator	–	19	20
Total	**118**	**121**	**239**

As can be seen in the table above, the management and executive levels are dominated by men although at the overall level the occupational gap within higher-level and lower-level men and women is just as wide. Ninety-six per cent of total female workers are in the graded category compared to 3.5 per cent in executive and 0.5 in management positions; while 94 per cent of total male employees are in the graded category compared to 5 per cent in executive and 1 per cent in management positions. As for the computer-related occupations, it is interesting to note that the highest-level (senior systems analysts) and lowest-level jobs are dominated by men and women respectively (keypunch and terminal operators) satisfying the feminist argument in part. However, there is almost

an equal number of men and women at the supervisory and middle-level positions. In fact there are more female systems analysts than men, and women seem to get promoted to supervisory and senior programmer positions as well as men. The data here then contradicts feminist arguments that women are denied entry to the new computer professional occupations and are to be found in the lowest jobs. In fact it seems that occupational stratification will occur across class and within ethnic lines rather than between genders.

What is the impact of computerization on employment? According to the Union President at TELMAL, management had stated that computerization in TELMAL has led to an overstaffing of between 4,000-5,000 workers, mainly in the technical and clerical levels. However I suspect that the issue of redundancy is more a political one rather than one caused by the computer 'culprit'. Employment in the public sector has expanded relative to the other sectors in the 1980s, with the intake focused on the Malay population who are being harnessed to provide political support and loyalty to government.[19] Apparently there have been no retrenchments so far because of the strength of the union, and I would add the ethnic consideration, as Malays represent 94 per cent of the total West Malaysian non-executive employees in TELMAL. But it seems that while the union can save people, it does not necessarily save jobs; nor does the union have a say in the hiring of contract staff, as was recently done with the intake of new telephone operators (international section) on a contract basis.

However to say that computerization has displaced labour is not entirely true either. For example, it is true that with the development, through Canadian consultancy, of the rather sophisticated CASS (Customer Automated Services System, apparently the only one in the world) many routine, clerical and technical tasks have been eliminated.[20] With the CASS mechanized service order system, all information about the subscribers is automatically processed, recorded, updated and stored, eliminating time consuming paper work. Before it would take a minimum of three months (with luck) to obtain a telephone line; with CASS one can be confident of receiving one's order within three days. With on-line billing from the various payment centres, data-entry operators who input all such information will no longer be needed. With the upgrading towards the Digital Switch system, several exchanges have been closed and telephone operators made redundant. Last, but not least, with the Cable Plant Assignment System, manual (technical) intervention is greatly reduced, there are no unnecessary visits leading to cost savings in the field. One of the CASS managers estimated that there was a reduction of 200 staff who have been re-deployed to other sections while new staff, mainly systems analysts and programmers have been recruited.

However at the same time, to serve other private capitalist interests, various contracts have been farmed out to private companies, from the laying of cables to the provision of telecommunications equipment. The issue then, is not computerization per se, but the socio-economic context of its implementation and the arena in which social conflict is negotiated. In the case of TELMAL, corporate interests are dominant over the interests of labour. However, because of the strength of the union, the collective agreement which was negotiated as a result of privatization guaranteed that no jobs would be lost as a result of the transformation. When the Company was floated on the stock exchange, the union also negotiated for these public issued shares to be sold first to the workers. The union was successful in obtaining these shares which were allocated according to the occupational grade of the workers, a small victory which at the same time reflected acquiescence to hierarchy given the huge disparity between shares allocated to executives and lower level workers.

TELMAL employees have also been at the picket lines to demand their year-end bonuses which were finally awarded to them. Worker consciousness, at least for economic gains, seem to be fairly high. During the time of the research, many of the staff, aware of the increased profits that the Company had made in 1990, were prepared to take to the streets again for their bonuses. Indeed, management with its reorganized human resources image seems to recognize the vital role of labour in 'their contribution to the success of privatization'. As stated in the 1989 Report:

> Union activities were encouraged in the genuine belief that these contribute to healthy industrial relations and provide for the effective resolution of issues on a collective basis.

It seems that employment prospects and working conditions will to a large extent be determined by how social conflict is resolved. In the case of TELMAL, at least during the transition period which occurred during a period of high growth, capital is open to trade union initiatives, realizing the vital contribution of labour to its corporate goals. It also depends on the level of consciousness of the union, which at the moment is bent on economic advantage rather than broader political goals of worker participation and democracy. Perhaps this is not surprising, given the history of trade unionism in the country as a whole which has become rather muted largely due to the anti-labour measures of the state.[21]

Given the situation, gender concerns do not seem to be one of the priorities of union demands. If they are, gender is either subsumed under economic demands or influenced by ideological constructs and images of the role of women. The 1987 Collective Agreement, which is yet to be resolved, demanded not less than the value of four annual increments to typists, teleprinter typists, machine operators and

data processing operators, on passing the speed test. Again, rather than recognizing the undervalued skills of such workers and the possibility of going up the career ladder given the realities of redundancy as a result of computerization, the union seems satisfied to retain their grade which is one of the lowest in the job hierarchy. The annual increment in their wages is also rather small. At the moment they start with a basic salary of M$407 per month with an annual increment of $17 per year compared to a starting monthly salary of M$2,002 with a M$66 annual increment at the officer level.

The same principle applies regarding health and safety. The Collective Agreement asks for a hazard allowance for those workers exposed to the emission of microwave or other radiation. However, rather than integrating the participation of workers in the design and reorganization of such systems, the union again focuses on reinforcing the system rather than transforming it to the benefit of workers. Hence typists, secretaries, clerks and data entry operators, the majority of whom are women, are not able to participate in the development and design of computerization at their work place. They will also not be able to learn and to understand how, if at all, radiation affects their reproductive health. This is the case despite the fact that the union leadership is fully aware of VDU hazards faced by the workers. In my interview with the union president, he told me that he had received many complaints from the women on the effect of the VDU screen on their health, many of them having eye problems and headaches. He also mentioned that there had been cases of miscarriages and he was well aware of the ILO standards of 10 minutes rest after an hour of continuous work on the VDU. While the union has set up an occupational health and safety committee, it seems that VDU hazards do not seem to be a priority issue.

Women employees are still primarily viewed as reproducers. While there are positive demands in relation to pregnancy and day care centres, specific activities recommended for the women workers are in Home Economics and Domestic Science. No wonder then that in the survey conducted, women workers responded that their chances of promotion were very poor. Of the total female respondents, 64 per cent had been in their jobs for less than 10 years, 27 per cent between 11 to 20 years, while 9 per cent had been stuck in their same jobs for more than 21 years. This was completely different for the male respondents - 94 per cent of them had been in their jobs for less than 10 years. The maximum number of years for women working without promotion was 33 years, compared to 15 years for men. Men were promoted after an average of working for 4 years compared to 9.5 years for women. The position of women office workers in the gender division of labour basically reflects their secondary position in the labour market and their primary responsibility in the family.

Changes in work organization, job content and skills

As discussed earlier, it is difficult to discuss the impact of IT on work organization, job content and skills on office workers as a whole. Office automation is not a unitary phenomenon as different levels and types of workers are affected differently depending on different circumstances. What I shall attempt to do here is to discuss, through case examples in the different sectors, the different categories of work and labour processes and how office workers are affected in relation to the above key issues.

The first applications of IT in TELMAL involved the simple mechanization of high-volume activities such as processing forms, billing subscribers and answering telephone calls involving key-punch operators using batch systems, typists and telephonists. The shift from manual to computerized performances were fairly straightforward as task fragmentation, or Taylorization, had already routinized these functions in the first place. Thus this early phase of automation conformed to the pre-existing division of labour of rationalized bureaucracies. The result was task fragmentation and the intensification of work which was decentralized into geographically-separated and gender-segregated units.

Routine keyboarding was separated from the rest of the clerical workers, both in terms of function as well as in space. In a sense, the technology demanded such spatial separation due to the convenience of the computer infrastructure set-up being centrally located. As a result of this fragmentation, the current data-entry operators (some of them transformed from key-punchers or degraded from typist position) worked on the machines all day, in shifts, and with set production standards monitored by the computer. Productivity-linked compensation schemes were sometimes introduced, to the detriment of the workers. In TELMAL, the current number of 45 data processing machine operators at the headquarters work three shifts, from 8 a.m. to 3 p.m., 9 a.m. till 4 p.m. and 12 p.m. till 7 p.m. which includes a rest hour of twenty minutes in the morning and a one hour lunch break. Many times they continue working overtime after office hours and come back on Sundays to work due to the heavy backlog. They are required to perform between 10,000-14,000 keystrokes per hour, their productivity report being posted on the wall the next morning. These workers are generally not allowed to move freely around nor to speak to their colleagues during work hours. Tension and pressures to perform permeate the small crowded workplace.

Similar conditions of work appear in MANAS and in another public sector agency (PUBS) we studied. In fact in PUBS, the initial transformation and degrading into data entry operators (from the

typist level) created serious conflicts between management and the workers concerned. There was a long and bitter strike action with the dispute finally settled, years later in the Industrial Court. According to the workers, in retribution, the manager who engineered the transformation died of a heart attack soon after. The present batch of 50 data entry workers, mainly women, who joined fresh in 1985 were offered a series of productivity-linked incentive schemes. Many of the women chose for the schemes, much to their regret later.[22] The scheme works as follows: when they first started, the majority, mainly single and just out from school, were requested to perform 10,000 keystrokes per hour for data entry and 12,000 keystrokes per hour for the verifying. If the quota was not fulfilled by the end of the day (the computer output is posted on the wall), the worker would be summoned by the immediate supervisor, who was extremely strict then, and reprimanded her. Later, the quota was increased to 11,000 keystrokes for data entry and 13,000 for verifying after management realized that the 'girls' were rather productive.

Their potential high level of productivity was 'discovered' through the incentive scheme whereby operators who could key in 15,000 keystrokes an hour four days a week were given two hours time-off the next week. Apparently many of the operators opted for this scheme just to obtain the two hours off. Later, the scheme was scrapped and their quota increased much to their anger. At the moment there is a continuous and bitter struggle with their immediate female manager to increase their wages (by two increments, i.e. M$30) for those who can pass the speed test of 15,000 key strokes per hour. Those who can perform 16,000 keystrokes will receive four salary increments.[23] This struggle is waged at the office level and does not involve the union, which according to the workers does not care about their problems. They are extremely harassed:

> I thought that working with the computer was the best. That is why I applied to this place. This is like working in a factory (*kerja kilang*). I cannot talk to my neighbour, I cannot rest, I cannot go to the toilet, I cannot write during my rest time. I cannot even use the phone. I feel very nervous about taking this speed test as they have brought in new machines and we are not given sufficient time to practise. We are not used to these new machines.

Similar intensification and control over work is seen in the case of the international telephonists at TELMAL and the reservations clerks at MANAS. During the phase of manual work, the telephonists seem to have more control over their work processes, being required to write down the information and at the end of the day collect the tickets, check, arrange by country and then send the final accounts to the billing sections. There was more time to move around and one knew how many calls were made per day. However, according to them, with the introduction of the computerized exchange in 1985-87 and with privatization, their work is intensified and there is more control. Now they have

to fulfil a quota of 3,000 calls per day or to complete a call within 10 seconds. The computer in another town 300 km away checks their productivity with a monthly report of their performance. They do not know how many calls they make on a daily basis, as the calls 'just go off in the air' in the screen. At the same time the telephonists, all females,[24] prefer the present system which is easier to handle. Only now there is more work to be done and they feel more pressured to perform.

At MANAS, with the set-up of the computerized hunting lines, calls are automatically distributed to the airlines reservations clerks. They are required to complete a call within three minutes and have a quota of 150 calls per day to handle. The supervisory console monitors their calls with information printed out every hour on a hard copy. The quality of their conversation is also monitored and tension is high. Small wonder that there is a very high turnover of staff in this section.

Typists and clerks and secretaries are spared this onslaught. Even though there is rationalization and increasing specialization, there seems to be more control (if skill is to be defined as such) over their work, or at least there does not seem to be much radical change in terms of pace and intensity of work. In fact the work becomes easier with the introduction of computerization. This is the case for small work groups which entail both clerical and typing responsibilities. An example at TELMAL is the work group which handles the mobile maritime service, handling international communication charges from ship to shore and from shore to ship. The five female clerks, under a female supervisor work in a separate room checking through an average of 1,500 dockets per month and typing in the relevant information on their typewriters. With the introduction of two personal computers in 1989, the work load has become lighter and easier. In fact there is a demand for each clerk to have their own PC. The person I interviewed seems to like her work and working environment - there is freedom of movement, although this is more restricted now with privatization. According to her,

> There are now more restrictions. We cannot take an afternoon tea break; there are specific times for breaks. We cannot relax as people are eyeing you, or we are afraid that others are eyeing you. There is now more pressure to work.

This suggests that the introduction of computerization in TELMAL, MANAS and PUBS has brought about changes in the work relations and organization at the office level. The first stage of automation seems to be in line with the Braverman position with regards to certain categories of workers whereby tasks become fragmented, deskilled, production becomes more controlled and centralized with increased occupational segregation. But this does not mean that office work is technologically driven. There is simply a meeting of interests between capital and automation and the computer capitalizes on processes already set in motion. However, different categories of employees are affected

differently - some are not affected at all, some have their work transformed in the classical Braverman fashion, while others are still involved in a variety of tasks and skills without undue loss of control over their work.

Recently, with the introduction of integrated and more sophisticated systems, there seems to be a reorganization which reverses some of these trends, while at the same time creating new ones in the process. However, the impact on work organization and processes remain to be seen, as the introduction of integrated systems has just been implemented. Nonetheless, some trends are emerging.

For example, certain data processing functions will soon be eliminated. With the introduction of CASS in TELMAL, the present batch of key-punch operators who are keying in the billing information received from the Post Office will soon no longer be needed. However, once CASS goes on-line at the end of the year, the operators will be deployed in other sections. The same will apply for the data-entry workers at MANAS whose jobs are being eliminated as the entire organization goes on-line. In fact, the remaining eight data-entry operators feel they have less data to key in and are just waiting to be re-deployed to other departments. Nonetheless, because of the nature of their function, data-entry in the government agency studied will not (and probably never will) be eliminated, unless the whole country is automated. Their work will continue to be more intensified with the increase of the working population and only a strong union, one which believes in the participation of workers in system design, can fight for their interests.

New skills can be acquired as in the case of bookkeeping clerks. With the present phase of integrated accounting, the earlier fragmentation of tasks in the various accounts units is being countered. For example, in the international section, the bookkeepers used to just 'input' the receipts from their various sources e.g. pay, allowances, refunds, leave, fines etc. These would then be in ledger form and the batches sent to the central accounts section for keying in which resulted in the production of daily and monthly reports (output). Since 1987, with the introduction of terminals, a new section was created, called 'Input/Output', whereby both tasks are integrated and new skills are acquired e.g. balancing, budget forecasts etc. The male bookkeepers in this section work as a team and they enjoy their work as they 'can see what they are doing'. While there is more work, they do not mind as it gets done at a faster rate and there is no pressure. In another sense, there is also less work, as the previous routine paper work is eliminated since the billing system is computerized.

With more advanced systems, the present centralization of command seems to allow for more decentralized control and thus more flexibility at the middle and lower levels. At the middle level, systems analysts, programmers and their end users have been found to work together, albeit mainly in implementing new systems on a trial basis. Clerical staff, as end users, meet the systems designers to change existing systems or to suggest new ways of obtaining information. At the lower levels, the position of pure typist is being eliminated as clerks take on their responsibilities, interchanging experiences. Here again, earlier fragmented tasks are re-united into single multi-task operations. Clerks become more independent as they are in charge of their specific operation.

What I am trying to suggest is that the introduction of IT does not entail inevitable consequences of work intensification, deskilling or innovation. The impact of IT is actually uneven, as the above discussion has shown. Flexible multi-functional jobs are possible, at least in certain clerical sections. If this is the case, then there are possibilities for intervention in the improvement of office work and in the recognition of the 'invisible, caring' skills of office workers. My survey of the skills clerical workers felt they possessed revealed that abstract and interactive skills (concentration, cooperation with others, problem solving, good memory) ranked above technical skills, such as good spelling and good grammar. In fact the performance rating of telephonists at TELMAL focus primarily on these 'invisible' skills - knowledge of the company, initiative, cooperation with fellow telephonists, respect for customers, patience, ability to communicate, to name a few 'caring' traits. This affirms the studies undertaken by Goodman, Lie, Pullman and Szymanski (cited earlier) who criticize current discussion on office skills for focusing too much on the routine, technical tasks which are easily visible, measurable and male constructed.

Health and safety

Needless to say, health and safety considerations are important issues especially for those who work constantly on the VDUs. Those who are affected include secretarial and clerical workers, typists, data-entry operators, telephonists as well as systems analysts and programmers who are consistently overworked. In general complaints related to the eyes, hands and wrists, shoulders, neck and back, and general health problems are commonly registered by these VDU users.

This is not surprising and the data just reinforces the results found in other research on VDT health and safety. The causes of such health problems include monotonous and repetitive work under highly pressured working environments, poor ergonomics, hierarchical social and labour relations in the

office, the intensity of which differs according to occupational groups. It is obvious that data-entry workers are the most pressured and suffer from more health hazards compared to system analysts, who even though they are under stress, have more control over their work and are able to take breaks and vary their work if they want to. The survey in the public sector found that within the data-entry category, 73 per cent of the female workers reported that they suffered from extreme exhaustion while 57 per cent experienced extreme migraine attacks; while one-third reported extreme anxiety and stress. However, the clerical and management staff reported less than 10 per cent incidence of each of the above complaints.

Controversy surrounds the issue of reproductive health. In a 1987 epidemiological study of 538 married staff in MANAS, with the objective of studying adverse pregnancy outcomes among VDU and non-VDU users, Selvadurai (1987:79-80) concluded that:

i) there was no significant difference in adverse pregnancy outcomes in both VDU and non-VDU users;

ii) among VDU users, there was no significant association between adverse pregnancy outcomes and varying periods of time worked with VDU (hours/week);

iii) the other related parameters (i.e. maternal age, ethnic groups, job function, the number of pregnancies and stress at work) did not significantly affect or alter the prevalence of adverse pregnancy outcomes in VDU and non-VDU users.

She clearly pointed out that 'it is thus evident that work with visual display units is not closely associated with any adverse or deterrent effects on the human biological system'.

My own study of pregnancy outcomes of data-entry workers, albeit a small sample, points to a different conclusion. Of the 42 married data-entry operators in the public agency, 10 (24 per cent) of them have had miscarriages within the last three years. They came in when they were still single (1985), married a few years later and experienced spontaneous abortions with their first child between the second and fifth month of pregnancy. Consider these two case studies.

Siti joined as a data-entry operator in November 1989 when she was 23 years old. In December she got married and became pregnant in March 1990. Five months later, in August she had a miscarriage. Siti says she is a 'slow' worker as she cannot fulfil the quota of 11,000 keystrokes per hour. She feels confused, scared, extremely pressured and is always worried (*selalu risau*) that she will receive a memo or be called up by the manager. Although her friends try to help her, this is not allowed by

the supervisor. As a result she works through her rest time. Everyday she feels pressured (*hari-hari tekanan*). During her pregnancy she was not well but was not allowed to wear slippers at work. She points out that her superiors do not appreciate the workers even when they perform beyond the quota - management only knows how to rebuke you.

Faridah joined in 1985, got married in July 1989 and became pregnant in September 1990. In November 1990 she suffered a miscarriage. In fact she did not know that she was pregnant until she was bleeding and was informed of her condition by the panel doctor. She remembers that during that time she was not well and was not performing well in her work. She could only input 9,000 keystrokes per hour and was called up several times by the manager whom she says was 'very hard' (*terlampau keras*) on her. She became very tense. Faridah feels that the tension she experienced working at the terminal was the cause of the miscarriage, although she feels that she does not take care of herself too well.

E. Concluding Remarks

Malaysia's intended leapfrog to a developed status within the next three decades has meant that IT has been given significant prominence with the state taking a leadership role in the ongoing formulation of an IT policy for the country. With the accelerated implementation of the privatization policy, the private sector has been called to be the catalyst of economic growth in the country. Since 1984, at least 22 public enterprises have been privatized. Under the Privatization Master Plan released in early 1991, 37 public enterprises and projects were to be privatized over the next two years and 56 more restructured. The telecommunications industry has also been given this boost since the government telecoms department was privatized in 1987.[25]

This paper has examined the impact of IT on women office workers in the tertiary sector in Malaysia, using the telecommunications industry as a case study. Various issues pertaining to the present debate were raised, particularly in relation to employment, skills and work organization.

In terms of employment, the introduction of IT has brought about changes in the employment pattern of office workers in the country, creating new opportunities in some occupations, while putting other jobs at risk. It can be said that, overall, there has been an increase of IT-related jobs especially at the higher levels due to the government's focus on hi-tech industry since the mid-1980s. With the

structural shift in the economy and the present economic boom, there has been a severe shortage of IT professionals.

The data also show that, at the macro level, certain jobs have been displaced or eliminated with the onslaught of the first phase of automation. In a sense, it is inevitable that machine card punchers will be made redundant with the introduction of the computer. New jobs have been created, the obvious ones being data-entry operators and computer professionals. However, with the present phase of more integrated systems, it is possible that the era of the data-entry operator might be over, as can be seen in the case-studies of TELMAL and MANAS. At the same time, it might be too premature to predict their demise particularly with the increased flexibility of IT which allows for decentralization in the preparation and data entry part of information. Several developing countries have been the recipients of such tele-work whereby data entry work has been internationally relocated to save labour costs in the developed countries (Pearson, 1991).

Based on the case study, the paper argued that there is no inevitable consequence of computerization at the office level, either within the 'capital accumulation logic' or the technological, euphoric arguments. The stage of socio-economic development within each country and the pre-existing division of labour are important mediators of how different phases of IT are implemented, and the differential and uneven impact of such phases on employment, work organization and the labour processes. In some cases, the fragmentation and rationalization of office bureaucracies already exist and computerization makes use of and intensifies these work processes.

In this study, Taylorization is usually, but not always necessarily, associated with the first phase of computer implementation. In other cases, there are no rapid transformations while in others previously individualized tasks become integrated. Small work teams, with more control over one's work (despite centralization), are made possible by the flexibility of microprocessor technology. The combination of computerization and privatization in TELMAL has led to increased stress for the lower level staff such as data entry operators who are required to key in between 10,000 14,000 key strokes per hour and telephone operators who have a quota of 3,000 calls per day, or 10 seconds per call. On the other hand, clerks and secretaries seem to have more control over their work which becomes more flexible with computerization, although at the same time their work load has increased tremendously.

Thus the second phase of advanced integrated systems could create the conditions for different ways of working, particularly at the clerical and middle-level occupations. In part, these new ways of

working (e.g. flexible team work, the company as a big happy family) are recognized as corporate strategies of present human resource management in response to present realities. At the same time these new work methods, combined with communication skills which demand more flexibility and productivity, are not readily recognized nor rewarded as skills. To be sure, the realization of improved working conditions depends on how such participation is negotiated, and the collective and political strength of the different levels of workers. Within a hierarchical and patriarchal set-up bent upon 'service with business' and under generally repressive conditions, complicated by ethnic tensions, the struggle will be a long one.

Employment for women office workers is also changing. It is not true that women will be inevitably pushed into low-skilled dead-end jobs as a result of automation, joining the proletariat masses i.e. the argument of capital making use of existing patriarchal relations. However, the clerical workforce is slowly becoming 'feminized' while the lower level data entry operators are largely female and highly-stressed domains. Women's position in the labour force is still secondary and ideologically constructed.

Nonetheless, in the Malaysian IT industry, at least more so than in other technological fields, women are making a headway into middle-level professional and management occupations, although the decision-making processes are still male-dominated. This means that gender segregation, as well as stratification among women along class lines will be probable future trends in the IT sector. Strategies to be built to overcome these gaps remain to be seen.

Endnotes

1 I would like to thank my colleague Jamilah Othman for collaborating with me on this two year study on Information Technology and Office Work in Malaysia. The case-study surveys of the different sectors (telecommunications, banking, public and airlines) would not have been completed, at different stages, without the assistance of Zak, Carol, Roslan, Henry, Rustam, Wan and Nik. I would also like to express my appreciation to Universiti Pertanian Malaysia and to the Institute of Social Studies, the Netherlands for their support in this research project. Special thanks to Thanh-Dam Truong, Gary Debus and Cees Hamelink for their helpful comments on the draft of this paper.

2 In its broadest sense, information technology (IT) comprises all technological elements that are related to the handling and processing of information. The IT industry encompasses all economic activities which produce contents and the facilities that deliver contents to end users. Within this definition, not only computers and communications equipment, as popularly understood, fall under this classification, but also book publishing, TV programme broadcasting, library systems and educational institutions.

3 Asian NICs like Singapore and Taiwan have strong state support while Latin American countries like Brazil, Argentina, Mexico and Cuba have national policies governing IT (Robina, 1989). Japan had an Information Society Plan Towards Year 2000 as early as 1972, while the United States, threatened by the growing Japanese presence, has had government intervention and government-private industry collaboration promoting research and development in response to the Japanese challenge. In the US the link of IT to the military industry is clearly obvious, expressed so coldly à la CNN in the recent Gulf War.

4 Braverman has also been criticized for separating the analysis of the labour process from the broader forms of class relations and the state, for not giving weight to workers' struggles and for failing to analyse the interests of male-dominated unions in maintaining their 'men's jobs' (Stephen Wood, ed., 1982).

5 Beechey (1982:63) states that 'in general terms, skilled labour can be objectively defined as labour which combines conception and execution and involves the possession of particular techniques'.

6 This term is taken from Hunt and Hunt (*op.cit.*) to mean the highly technical and professional work in computerization and at the other end the routine data-entry operations.

7 The decentralization of office work, in its various forms, has been variously known as tele-work, remote work and distance work (Huws, 1991).

8 When I was in London in July 1991, I spoke to some members of City Centre, an organization providing support to office workers. During the course of our conversation I was informed that data entry operators in London refused to enter data regarding the much-hated poll tax initiated by Margaret Thatcher. Apparently batches of these data were sent by satellite to Malaysia to be processed and were promptly completed and returned within a week.

9 This discussion draws heavily on previous work undertaken (Ng and Jamilah, 1991).

10 The most uncontroversial issue is that of health and safety. Perhaps, because it is so, it is also unrecognized and not taken seriously as an important health issue as reflected in the lack of regulations related to VDU usage. And where there are regulations, they are hardly followed reflecting the power balance in the office hierarchy.

11 It should be noted that structural changes and the process towards industrialization started in the mid-1970s when Malaysia diversified her economic base, as well as opted for an export-oriented manufacturing policy. As a result there has been a considerable shift from a primary-based economy to one oriented towards manufacturing and modern services. By the mid-1980s, manufacturing had overtaken agriculture as the largest contributor to GNP and by the end of the century, industrial production is targeted to account for 80 per cent of GDP (see reports in STAR for the month of February 1991).

12 The poor performance of public enterprises was one of the reasons for decreased public sector participation in the economy. By 1987, public enterprises accounted for more than one-third of the public sector's outstanding debt and more than 30 per cent of total debt servicing. Added to this was the misappropriation of funds by politicians for political ends, the M$2.5 billion BMF scandal being the most outstanding example. In actual fact, the end result of privatization was the replacement of public monopolies by private monopolies of either politically connected bumiputra elites in partnership with non-bumiputra elites or foreign investors (Gomez, 1990). The case of the telecommunications industry was no different. Sub-contracts amounting to billions of dollars were awarded to former executives in the government-owned telecommunications department (Lent, 1991).

13 The current exchange rate of Malaysian Ringgit to U.S. Dollars is approximately M$2.50 to US$1.

14 Draft Report on Policies and Plans for Computerization in the Public Sector, Prime Minister's Department, 1990.

15 I have used the fictitious name TELMAL to represent the telecommunications company as permission to undertake the research was based on the understanding that the name of the company should not be revealed. Similarly I have constructed the term MANAS for the airlines company and PUBS for the public sector agency studied.

16 Appendix A provides a picture of the telecommunications infrastructure in Malaysia.

17 The survey was conducted between January and March 1991 and covered 30 per cent of office personnel at the headquarters who used computers at least an hour daily.

18 TELMAL registered a pre-tax profit of M$365.8 million before extraordinary items in 1989 representing a sizeable increase over the M$180.4 million pre-tax profit recorded in 1988. At the time of the research in March 1991, it was rumoured that the 1990 pre-tax profit was M$550 million.

19 Malaysia is a multi-ethnic country comprising Malays and indigenous groups (55 per cent), Chinese (34 per cent), Indians (10 per cent) and Others (1 per cent). Political power is held by a multi-party coalition of communally based parties dominated by the élites of each ethnic group who use ethnicity and more recently, religion, to advance their own political and economic power in the country.

20 CASS has 12 subsystems, viz. mechanized service order system, customer accounts update system, cable plant assignment system, line number assignment system, network input system, toll, customer payments system, meters, customers invoice system, collections, financial management reporting system and security.

21 The ability of the TELMAL union to fight for improved working conditions and the openness of management and the state remain to be seen. The case of the airline company strike is a lesson to be learnt. Six years after privatization, the airline union went on strike, after collective bargaining negotiations fell apart. Afraid of the increased militancy of the workers, the state stepped in and arrested the union leaders under the notorious Internal Security Act, which allows for preventive and indefinite detention without trial. The history of labour struggles in Malaysia has been one of continuous state repression directly through arrests, and indirectly through the enactment of anti-labour laws which usually coincided with increased foreign investment, privatization and, of course, labour unrest.

22 They were especially hired when the government agency, a social security establishment, went on-line to improve its services and credit control over its customers. This meant sending out 100,000 forms monthly to the various employers who hired more than 5 million employees in the total labour force.

23 The data-entry workers start with a salary of M$350 per month with an increment of M$15 per year, the maximum being M$700 per month. This is lower than the wages paid to similar type of work at TELMAL. There the data-entry workers start with a basic salary of M$407 per month with a M$17 yearly increment and can reach a maximum of M$935 a month after working for 24 years. In general, unskilled factory workers in Malaysia earn a basic salary of M$200-300 per month. Many production workers earn on a daily basis - between M$7 and M$12 per day in the more industrialized western states in Peninsular Malaysia and as low as M$5 per day in the east coast states where there is a labour surplus.

24 Apparently the policy to have an all-women team, 24 hours a day, started in 1983 when there were numerous complaints about the rough and shoddy responses of male telephonists. According to management, women are more serious, gentle and scared of their superiors compared to the men who would be more 'daring'. Other rumours also tell of how the men used the exchange for their own personal calls.

25 Although important, this paper does not discuss the implications and outcome of the privatization of the telecommunications department which has come under criticism from various quarters. It has been argued that the emerging telecommunications and computer industry have become the monoploy of a few groups (domestic and international conglomerates) and individuals. Also raised are issues pertaining to the 'lack of a clearly stated telematics policy, the capability of the government to use computers to control/manipulate information to benefit the privileged, the absorption of westernizing influences, and the struggle among a few competing elites for control...' (Lent, 1991: 196).

Appendix A:
Status of Telecommunication Infrastructure in Malaysia

Public Switched Telephone Network

- relatively low penetration ratio (telephones/household) of 6 per cent versus 34 per cent for Singapore (1983), 29.6 per cent for Taiwan (1986), 51.4 per cent for UK, 80.1 per cent for US;

- Fifth Malaysia Plan target of 13.8 per cent penetration ratio;

- a major programme of conversion of switching system towards digital SPC systems has been underway since early 1980s; presently over 60 per cent of the switching system is now digital (NEC/Ericsson);

- a major expansion programme of fibre-optic cables has been initiated; an optic fibre link between Kuantan and Kota Kinabalu has been proposed, with an eventual linking of Kota Kinabalu to Hong Kong on the drawing board;

- the installation of a nation-wide cellular network of mobile telephone systems ATUR commenced in 1985 has now been completed, making Malaysia one of the first developing countries to have done so;

- HF, VHF communication facility for ship-to-shore communication, paging systems and telemetering have also been installed;

- two satellite earth stations are in operation;

- a satellite communication service, the Intelsat Business Service (IBS), which provides a link to USA through Intelsat's Pacific Ocean Satellite V is to be operational this year.

Value-added Network Services (VAN)

- enhanced telex, telefax and data transmission (DATEL) services have been introduced since 1983;

- a packet switch public data network system, MAYPAC, was introduced in 1984;

- a circuit switch system, MAYCIS, was introduced in 1987.

Computer Networks

- various private Wide Area Networks (WANS) systems have been installed within selected MNCs;

- many private Local Area Network (LAN) systems exist within local businesses;

- a National Unix-based Computer Network, the 'rangkom' System, which links MIMOS, the local universities and the international Usenet sysrem has been developed by MIMOS;

- 3 ATM networks (ABC, GREAT, MEPS) were launched in 1987/88 covering all major banks and finance companies;

- a pilot EFTPOS between a major bank and selected petrol kiosks has been launched.

Radio and Television Broadcasting Network

- three TV channels;

- Viewdata (Telita) and teletext (Beriteks) are provided.

Database Services

- Financial/Economic/Share Market data services have been introduced or are coming soon;

- other international database services are accessible;

- computerized library cataloguing system at major universities.

Source: Wong (1990)

References

Albin, Peter and Appelbaum (1988) 'The Computer Rationalization of Work: Implications for Women Workers', in Jenson, Jane et al (eds).

Armstrong, Pat (1984) *Labour Pains: Women's Work in Crisis*, Toronto, Women's Educational Press.

Baran, Barbara and Teegarden, Suzanne (1987) 'Women's Labor in the Office of the Future: A Case Study of the Insurance Company', in Beneria, Lourdes and Catharine, R. (eds) *Women, Households and the Economy*, New Brunswick (etc.), Rutgers University Press.

Beechey, Veronica (1988) 'Rethinking the Definition of Work', in Jenson, Jane et al (eds).

Beechey, Veronica (1982) 'The Sexual Division of Labour and the Labour Process: A Critical Assessment of Braverman', in Wood, Stephen (ed).

Bramwell, Ros and Davidson, Marilyn (1991) 'The Impact of Work with Visual Display Units (VDUs) on Women's Reproductive Health: A Prospective Study', Paper presented at 4th Conference on Women, Work and Computerization, 30 June-2 July 1991, Helsinki, Finland.

Braverman, Harry (1974) *Labor and Monopoly Capital*, New York, Monthly Review Press.

Clement, Andrew (1991) 'Designing without Designers: More Hidden Skills in Office Computerization?', paper presented at the 4th Conference on Women, Work and Computerization, 30 June-2 July 1991, Helsinki, Finland.

Cockburn, Cynthia (1983) *Brothers - Male Dominance and Technological Change*, London, Pluto Press.

Cockburn, Cynthia (1985) *Machinery of Dominance: Women, Men and technical Know-How*, London, Pluto Press.

Crompton, Rosemary and Jones, Gareth (1984) *White-Collar Proletariat: Deskilling and Gender in Clerical Work*, London, MacMillan Press.

Dy, Fe Josefina (1985) *Visual Display Units: Job Content and Stress in Office Work*, Geneva, International Labour Office.

Economic Planning Unit, Prime Minister's Department (1991) *Privatization Masterplan*, National Printing Department, Kuala Lumpur.

Edwards, Chris (1990) 'Malaysia's Industrialization - What Next?', Paper presented at Malaysian Institute of Economic Research Conference, Kuala Lumpur.

Feldberg, Rosyln and Glenn, Evelyn (1983) 'Technology and Work Degradation: Effects of Office Automation on Women Clerical Workers', in Rothschild, Joan, *Machina Ex Dea: Feminist Perspectives on Technology*, New York, Pergamon Press.

Gomez, Terence (1990) *Politics in Business: UMNO's Corporate Investments*, FORUM, Kuala Lumpur.

Goodman, Sara Ellen (1985) 'Computerization and the Skill in Women's Work', in Olerup, Agneta et al (eds), *Women, Work and Computerization: Opportunities and Disadvantages*, Amsterdam, North Holland.

Government of Malaysia (1991) *Malaysia: The Way Forward (Vision 2020)*, Government Printers, Kuala Lumpur.

Government of Malaysia (1991) *Sixth Malaysia Plan 1991-1995*, Government Printers, Kuala Lumpur.

Greenbaum, Joan (1991) 'Participatory Design - The Head and Heart Revisited', paper presented at the 4th Conference on Women, Work and Computerization', 30 June-2 July 1991, Helsinki.

Hartmann, Heidi (ed) (1987) *Computer Chips and Paper Clips: technology and Women's Employment*, Washington, National Academy Press.

Hunt, Allan and Hunt, Timothy (1987) 'Recent Trends in Clerical Employment: The Impact of Technological Change', in Hartmann, Heidi (ed).

Huws, Ursula (1987) *VDU Hazards Handbook*, London, London Hazards Centre.

Huws, Ursula (1991) 'Telework: Projections', *Futures*, January/February

ICFTU (1983) 'New Technology and Women's Employment', a Report submitted to the ICFTU Women's Committee at its 47th meeting in Brussels.

Jamilah Ariffin (1978) 'Industrial Development in Peninsular Malaysia and Rural-Urban Migration of Women Workers: Impact and Implications', revised version of paper presented at the 10th International Congress of Anthropological and Ethnological Sciences, December, New Delhi, India.

Jenson, Jane et al (eds) (1988) *Feminization of the Labour Force*, Oxford, Polity Press.

Jomo, K.S. (1990) *Growth and Structural Change in the Malaysian Economy*, London, Macmillan.

Jong, Frida de (1988) 'The Times, Are They A-Changing?', in Tijdens, Kea et al (eds), *Women, Work and Computerization: Forming New Alliances*, Amsterdam, North Holland.

Lehto Anna-Maija and Eriksson, Inger (eds) (1991) *Proceedings of the Conference on Women, Work and Computerization*', 30 June-2 July 1991, Helsinki.

Lent, John (1991) 'Telematics in Malaysia: Room at the Top for a Selected Few', in Sussman, Gerald and Lent, John (ed.), *Transnational Communication: Wiring the Third World*, Sage Publications, London.

Lie, Merete (1991) 'Technology and Gender: Identity and Symbolism', in Lehto, Anna-Maija and Erikkson, Inger (eds).

Lie, Merete and Rasmussen, Bente (1985) 'Office Work and Skills', in Olerup, Agneta et al (eds).

Lie, Mereta and Rasmussen, Bente (1990) 'Step by Step: New Systems in an Old Structure', in Dy, Josefina, *Advanced Technology in Commerce, Offices and Health Services*, Newcastle, Avebury.

Lim Gek Kheng (1989) 'Women's Participation in the Computer Industry in Singapore', in Tijdens, Kea et al (eds).

Ministry of Science, Technology and Environment Malaysia (1990) *Industrial Technology Development : A National Plan of Action*, Kuala Lumpur.

Mitter, Swasti (1991) 'Computer-Aided Manufacturing and Women's Employment: A Global Critique of Post-Fordism', paper presented at 4th Conference on Women, Work and Computerization, 30 June-2 July 1991, Helsinki, Finland.

Mohammad Ahmadullah Siddiqi (1987) *An Assessment of the Evolving Telematics Policies in Malaysia*, unpublished Ph.D. Dissertation, Temple University, U.S.A.

Ng, Cecilia and Jamilah Othman (1991) 'Occupational Health and Safety Among Office Workers: A Preliminary Study', in Nicholas, Colin and Wangel, Arne (eds), *Safety at Work in Malaysia: An Anthology of Current Research*, Kuala Lumpur, University of Malaya.

Office of Technology Assessment (1985) *Automation of America's Offices*, Washington, Congress of the United States.

Olerup, Agneta et al (eds) (1985) *Women, Work and Computerization: Opportunities and Advantages*, Amsterdam, North Holland.

Ormos, Marta and Blameble (1988) 'Strategies of Introduction of Office Automation in Mixed and Traditionally Female Jobs Within Two Work Units of the French Electricity and Gas Public Utility Companies', in Tijdens, Kea et al (eds), *Women, Work and Computerization: Forming New Alliances*, Amsterdam, North Holland.

Pearson, Ruth (1991) 'Gender and New Technology for Women: New Work for Women?', paper presented at the International Workshop 'Women Organising in the Process of Industrialization', 15-26 April 1991, The Hague, Netherlands.

Pearson, Ruth (1991b) 'The Internationalisation of Office Work: New Technology and Employment Prospects for Women in LDc's', unpublished manuscript.

Perera, Judith (1991) 'Complaints of the Computer Age', in *South*, May.

Perry, Ruth and Greber, Lisa (1990) 'Women and Computers: An Introduction', in *SIGNS: Journal of Women in Culture and Society*, Vol. 16, No.11.

Prime Minister's Department (1990) 'Policy and Plans for Computerization in the Public Sector', Kuala Lumpur.

Rajah, Rasiah (1988) 'Production in Transition and its Impact on the Semiconductor Industry in Penang', *Kajian Malaysia*, 6 (1).

Robina, Soledad (1989) 'Notes on the Use of New Technologies in Latin America', in Tijdens, Kea et al (eds).

Selvadurai, Selvayogini (1988) *Adverse Pregnancy Outcomes Among Visual Display Unit Operators*, unpublished M.Sc. Dissertation, National University of Singapore.

Shibayama, Emiko (1987) 'The Impact of Microelectronics Technological Innovation on Working Women - Its Merits and Demerits',

Shiga, Hiroko (1987) 'Microelectronics and Women in Japan', in Ng, Cecilia (ed), *Technology and Gender*, Kuala Lumpur, Malaysian Social Science Association.

Syed A. Rahim and Pennings, Anthony (1987) *Computerization and Development in SouthEast Asia*, Asian Mass Communication Research and Information Centre, Singapore.

Tan Boon Kean (1986) 'Women Workers in the Electronics Industry', in Hing Ai Yun and Rokiah Talib (eds) *Women and Employment in Malaysia*, Department of Anthropology and Sociology, Kuala Lumpur, University of Malaya.

Tengku Azzman Shariffadeen et al. (1991) 'Microelectronics in Malaysia: Present Status and Future Prospects', paper presented at the MIMOS and UNIDO Expert Group Meeting on the Design, development, Manufacture and Application of Microelectronic Components, 4-8 March, Kuala Lumpur.

Tijdens, Kea et al (eds) (1988) *Women, Work and Computerization: Forming New Alliances*, Amsterdam, North Holland.

Vasquez, Pilar (1988) 'Automation at the Mexican PTT: Does it Replace the Telephone Operator?', in Tijdens, Kea et al (eds), *Women, Work and Computerization: Forming New Alliances*, Amsterdam, North Holland.

Webster, Juliet (1988) 'Influencing the Content of Women's Work in Automated Offices', in Tijdens, Kea et al (eds), *Women, Work and Computerization: Forming New Alliances*, Amsterdam, North Holland.

Werneke, Diane (1983) *Microelectronics and Office Jobs: The Impact of the Chip on Women's Employment*, Geneva, International Labour Organisation.

Wong Poh Kam (1990) *Information Technology Sector*, Draft Report submitted to Committee on an Action Plan for Industrial Technology Development.

Wood, Stephen (ed) (1982) *The Degradation of Work? Skill, Deskilling and the Labour Process*, London, Hutchinson.

Other Sources:

STAR, Series of articles on the Labour Shortage in Malaysia, 1-19 February 1991.