The Impact of New Technology on Labour Forces:
Some Evidence from Southeast Asian Countries

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THE IMPACT OF NEW TECHNOLOGY ON LABOUR FORCES: SOME EVIDENCE FROM SOUTHEAST ASIAN COUNTRIES

Noryamin Aini

Introduction
Many people have a general idea that new technology will drastically change patterns of social life and it will have a catastrophic effect on the level of employment and labour relations. On the other hand, for most people, it will retain a mystique rendering them unable to respond to the genuine issue it raises and leaving them apprehensive about its consequences. Yet when it is introduced, most people readily adapt to it.

This paper argues that arguments about the unfavourable impact of new technology on employment and labour relations should be treated with some caution. Taking the extensive debates on the impact of new technology on employment and labour relations, the main aim of this paper is to discuss some evidence revolving around the impact of new technology on labour relations and employment in Southeast Asian countries; Malaysia, Singapore and Indonesia with a simple comparison to a study in England. First, I will discuss the characteristics of material sources supporting this comparative study followed by a discussion of the theoretical debates on the question. Third, I will analyse the impact of new technology on labour relations and employment focusing on a number of issues: (a) job-loss, job-creation and job diversification, (b) who benefits from, retrenchment and labour relations, and (c) deskilling. Finally, I will compare the general findings from Malaysia, Singapore and Indonesia with a study in England and end with a concluding section.

The Characteristics of Material Sources
This paper, basically, will review several research reports concentrating on the impacts of using new technology within various sectors in Malaysia, Singapore and Indonesia and England. In this section, I will very briefly discuss the main features of the sources of material. First, all data and information originating from various studies and covering various sectors using at least sixteen studies are employed to support this analysis classified into (1) two on cigarette manufacturing, (2) one on textiles, (3) two on the electronics industries, (4) four on information technology, and (5) seven on a general theme.

Second, these studies have been conducted and published from the mid-1980s up to 1992, except one study which was conducted before 1985 in England. Third, because the study in England was conducted earlier, in some senses, it may not be comparable. However, I do not intend to make a precise comparison between the study in England and those in Southeast Asia, rather I want to make a more a sensible analysis of the impact of new technology in the Malaysia, Singapore and Indonesia. The data in all tables in the appendix were calculated into percentages to be more readable.

The term 'new technology' is a subject of debate. In a broad context, it has been defined as machinery based on microelectronics and the associated machines for communicating between such equipment which can be utilised in a process of transforming inputs into outputs (Inoue 1989: 29; Taylor, et al 1986). It is the comparative cheapness and compactness of the new equipment that radically distinguishes it from its earlier generations which were based on conventional circuitry. In addition to this definition, new technology is generally used for several purposes such as to reduce the cost of production, to increase output, and to put it in 'Taylorist' context, to control the production process (Jenkin 1985: 378; Wood 1987: 7-8; Jones 1982, Littler 1982). By this broad definition, we could consider the use of new technology in various industrial arenas. Manufacturing industry, for example, transforms raw materials into intermediate or final products by combining machinery and labour. The computer industry is an example within the industrial sector which almost by definition uses new technology. Basically, new technology performs functions similar to those of earlier computer-based machinery. Tasks which were not previously
carried out by computers due to the high cost or organisational and technical problems of access to the equipment can be carried out easily and quickly by the microelectronics which are commonly associated with new technology.

Many people maintain that new technology has a place at some point in every industry and productive activity (Green, et al 1980). This pervasiveness is a positive basis of the public impression of new technology. Central to this impression, there are, at least, two reasons why new technology can be favourably considered (Taylor, et al 1986). The first is that new technology does not do anything fundamentally new. Whether used to replace a mechanical control or to extend traditional computing power, new technology is normally introduced in a way that modifies and improves an existing activity rather than transforming or eliminating it. However, many people remain cautious, and reject the idea that difficult and unfamiliar changes will have to be made. From this point, it seems that societal responses to new technology may vary between those who already know the importance of a particular technology to others who have not been exposed to it. Therefore, an a priori assumption is that the technological impact and response to them may differ between developed and less developed countries.

The second reason is that in spite of the propaganda on the dramatic impact of new technology, the rate at which innovations are introduced does not depend solely on the rate of development of the technology itself. Technology is only one element amongst many other factors which also share in transforming these impacts. Organisations or companies usually introduce new technology for specific reasons. Therefore, employers and workers in particular normally experience the introduction of new technology as something connected with problems with which they are familiar. Having mentioned the previous reasons, however, workers’ resistance to new technology, especially from those whose jobs are susceptible to loss due to the use of new technology, should not be under-estimated. Some evidence, at least in part, demonstrates that skilled workers are often resistant to the use of new technology (Rolfe, 1990).

Jobs Loss, Creation and Diversification

There are serious debates about the impact of new technology on labour forces within industrial contexts. One view assumes that the introduction of new technology will bring about many advantages. New technology has a capacity to cut the costs of providing products and services. In some cases, cost reductions are dramatic, while in others more marginal. The effect of new technology on employment and labour relations, in part, originates from cost cutting, especially for those who assume new technology as a determinant factor. Within the context of these debates discussion arises concerning the way this cost cutting is best applied. Two contradictory views have been posited on this point; optimistic and pessimistic.

The first view considers that the implications of new technology are generally seen to be positive, such as the ability to create new jobs (Jenkin 1985: 378). While many commentators even argue that new technologies can constitute a new industrial revolution. However, the precise nature of that revolution is a subject of considerable disagreement (Smith 1992: 752). Managerialist proponents, for example, argue that new technology will remove routine jobs and create more skilled opportunities, such as the computer programmer (Jenkin 1985: 377-80).

It is important to consider the capacity of new technology in job creation and cost of production reduction. Jenkin (1985) has pointed out that

the primary reason for introducing new technology such as robots is to reduce costs and improve product quality. Lower costs mean lower prices. With the improvement in product quality, this results in increased demand for our goods and services, which in turn generates higher output and employment. Profits also increase, inducing higher investment and R&D expenditure, thus creating jobs. Finally investment in robot and other microelectronic-based equipment provides opportunities for domestic producers of such capital goods to increase output and employment (p 378).

Similarly, it has been suggested that if prices do fall in line with increasing productivity, then this will raise real incomes and enable consumers to increase their consumption. This process could give rise to multiplier effects. In other words, the products become cheaper, demand is generated, and employment can be created (Taylor et al 1986, Gordon and Kimball 1985). However, in spite of its capacity in creating new jobs, there is a certain limitation on new technology to realise this expectation, and it could be explained from the standpoints of short term (the effect in process) and long-term waves (the effect in product) (Brady and Liff 1985: 387-8, Taylor et al 1986).
In terms of the effect of technological innovation in products and the effects of innovation in process, Schmidt (1983), argues that new technology is suspected as a job killer when applied to process certain jobs, but as a job creator, through product innovations, in other circumstances. Innovation in products is seen as a potential source of additional employment; when the demand for products increases, there is the likely possibility of creating jobs with added values. With higher demand the opportunities for the marketing arise, and, in turn, the possibility of job creation. Conversely, the likely effect of new technology on process is described in the following terms:

In the case of process innovations, the picture is more complex as these could add or subtract from employment levels. If some new process is discovered it could mean that products not previously possible may now be produced, with all the attendant employment multiplier effects. Alternatively, new techniques could be developed which reduce the labour input required to produce any given output. The effect is therefore to reduce employment unless the resultant cost savings are passed on to the consumers. In this case if price elasticity of demand is sufficiently elastic, output can be increased. If this same proportionate increase in demand outweighs the productivity increase, then employment is encouraged to expand too (Goddard and Thwaites in Taylor, et al, 1981: 4).

From the previous quotation, it is clear that the effect of new technology on creating or cutting jobs depends on (1) whether the increase in demand creates more jobs, after many jobs are eliminated in the initial process of introduction of new technology, or (2) whether demand for new or dramatically cheaper products and service creates more jobs than are displaced from traditional industries which lose trade to the new industries. Therefore, the effect on jobs could be firstly negative and later positive. However, the long term wave theory does not precisely mention how long the period should be for an appropriate evaluation of the effect. Further to this, the data on the long wave theory is not wholly convincing. Taylor and his colleagues (1986, 5) have argued that it is extremely difficult to obtain adequate data to test this theory, therefore, the long wave theory is best regarded with caution.

The second view seems pessimistic. Though neither particularly convincing nor consistent, many initial studies, especially those documented by trade unions, have shown that the introduction of new technology will cut many jobs. In his pioneering study of the impact of automation on employment, Wiener (1950: 109) concluded that a very serious unemployment situation would follow new technology. Recent studies in Canada have prophesied that new technology will result in job losses, the most vulnerable of whom will be women's jobs in the manufacturing and service sectors. For example, it was predicted that up to 25 per cent of jobs in the business and financial sectors, in Canada, would disappear by 1991 and 200,000 female clerks would be made unemployed in the best circumstances, and in the worst, 750,000 (Armstrong, in Ng 1992: 5). Additionally, according to Brady and Liff (1985: 384) it has been suggested that there is widely held view that a robot installation replaces on average five workers. So, if in Britain, there were over 700 robots installed at the end of 1981, this would mean that about 3500 jobs had been taken by robots as a direct result. Many other studies have found similar findings of negative impact on jobs.

However, by showing the negative effect of new technology on employment, it seems entirely wrong to draw conclusions about the negative effect of new technology on jobs overall from the example of its effect on individual firms or workers. This is partly due to the fact that new technology is likely to lead to a shift in employment from one activity to another, especially in less developed countries. For instance, the automation of record keeping activities in offices will reduce the number of staff needed for record keeping, on the other hand, it will make possible more extensive analyses of information and more extensive control and monitoring activities. An organisation/industry may choose to cut certain staff/workers and forgo the opportunities offered by new technology in the areas of analysis and control. Alternatively, staff/workers will be switched to new duties or a different type of staff/workers hired. Therefore, it is important to consider such possibilities within the context of the introduction of new technology.

One point should be pointed out in regard to the pessimistic view. This view often uses, within a national level, the rate of unemployment as a tool to evaluate the negative effect of new technology. Is the introduction of new technology the sole factor which cuts jobs, so that the rate of unemployment will increase? By and large, the studies supporting this pessimistic viewpoint seldom specifically focus on this question. Rarely is there any particular study which investigates how far other factors have shared with new technology in decreasing the number of jobs. In addition, there is clear evidence that in Japan and also Sweden which predominantly have installed high technologies, the rate of unemployment is still lower compared to the rate in
other industrial countries which have not yet installed the equivalent number of automatic technologies (Jenkins 1985: 378; Inoue 1989).

Also reducing the credibility of the pessimistic view, is a contentious debate as to whether new technology is an independent factor in the increase and decrease of jobs (Gordon and Kimball 1985). The first view in a sense of "technological determinism", suggests that the introduction of new technology is quite independent from other factors in leading to economic recovery and an increase in wealth and employment. Once it is installed, it will increase production and in turn will expand other jobs. However, to a certain degree, the proponents of this view generally accept that there will be a difficult period of transition while employment is lost from traditional industries, and capital is reinvested to create jobs in the new industries.

The second view points out that the ability of new technology to increase productivity and create more jobs depends wholly upon various economic factors such as market situation, world economic stability and management (Brady and Liff 1985: 382; Smith 1992: 757, 770). Further to this point, it is true that new technology may create additional demand for a product. This demand could be attracted from the domestic economy, and then will lead to an increase in employment if the effect of the additional demand attracted outweighs the effect of the increase in productivity. Yet the amount of additional demand created is not simply a result of the cut in the cost of production and service. If the economy is depressed, a cut in costs through technological innovation will not attract sufficient demand to outweigh other factors and the effect of productivity may not increase employment. Therefore this view argues that the decrease in jobs at the time of introducing new technology may not be wholly caused by the technology itself but by other factors such as a recession.

By contrasting the pessimistic and optimistic views, it is clear that the findings on the impacts of new technology on employment are contested, and this should come as no surprise. Previously, the anticipated effect of new technology has been dependent upon assumptions concerning the economy as a whole. Predictions of the future effect of new technology on jobs involves assumptions concerning the interaction of technological and economic factors. In this paper, I want to suggest that the introduction of new technology is a causative factor either increasing or decreasing the number of jobs. By saying this, I will treat the introduction of new technology as an aspect which can be studied separately especially in terms of process, though I strongly believe that there are other factors which together affect this issue. However, due to the unavailability of data, this may become problematic. Does the introduction of new technology create more jobs or conversely cut existing ones? Central to this point is that if new technology really can create more jobs, who will benefit from it and is there a pattern of job diversification, especially in the case of developing countries which often lack skilled workers?

**Labour Relations and Retrenchment**

In western industrial countries, trade unions play an important role in maintaining the workers' interests. Furthermore, these unions often become politicised. In contrast, though currently becoming stronger, trade unions have been less significant in Southeast Asian countries, especially in Malaysia, Indonesia and Singapore (Manning 1993: 73-4; Cohen 1993; Salih and Young 1985 and 1989). In more industrialised countries, trade unions have become critically aware of the impact of new technology on employment. The extent of awareness, particularly of the skilled worker, has been often reflected by their resistance to the use of new technology, especially that which will take over their jobs (Roffe 1990: 108). This resistance is often explained in terms of tension between employers and employees. It has been typically argued that skilled workers may adopt an oppositional stance toward technological change in order to defend skills and practices from which they derive control and satisfaction, conversely, unskilled workers are seen as too weak to respond due to their powerless position in the production process (ibid). This assumption is based on the logic that the new technology will deskill and eliminate many more skilled jobs than it creates.

My focus is not on worker resistance to the introduction of new technology, but rather, on how employers, employees and state approach this problem. Of particular interest are national policies concerning efforts to harmonise the relationship between the interest of employers and employees, especially in Singapore, Malaysia and Indonesia.

Some pioneer studies, especially in Malaysia and Singapore, have been conducted to analyse the impact of new technology on employment, and the degree to which new technologies cut jobs or conversely create new jobs. Much of the data documented by government offices is not well-organised (Geok 1989), and in some cases is clearly biased. In addition to limited studies on this theme, common concerns of previous analysis on the impact of new technology tend to concentrate...
on a positive impression of technology, and, as such, reflect a "technological determinism", linking technology as a necessity for accelerated economic growth. Given this point, the studies of the impact of new technology often do not take negative aspects into account such as deskilling, work degradation and unemployment. It follows that this paper represents a starting point for further cross-national analysis concerning the impact of new technology in Malaysia, Singapore and Indonesia.

The evidence reported in these studies is not consistent. Roughly speaking, the impact of new technology in Malaysia, Singapore and Indonesia has typically reflected something different from that in more developed countries.

Studies in Malaysia

Table 1 Peninsular Malaysia: Employment by Selected Occupation 1975, 1985 and 1987

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Group 1 - Professional, Technical and Related</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workers</td>
<td>1975</td>
<td>1985</td>
<td></td>
<td>1987</td>
<td></td>
</tr>
<tr>
<td>Statistician</td>
<td>316</td>
<td>97</td>
<td>-69</td>
<td>150</td>
<td>55</td>
</tr>
<tr>
<td>Mathematician and Actuaries</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td>System Analyst</td>
<td>172</td>
<td>1395</td>
<td>711</td>
<td>2177</td>
<td>56</td>
</tr>
<tr>
<td>Computer Programmer &amp; Statistical and Mathematical Technicians</td>
<td>335</td>
<td>2282</td>
<td>581</td>
<td>3183</td>
<td>40</td>
</tr>
<tr>
<td><strong>Group 2 - Clerical and Related Workers</strong></td>
<td>1975</td>
<td>1985</td>
<td></td>
<td>1987</td>
<td></td>
</tr>
<tr>
<td>Clerical Supervisors</td>
<td>5430</td>
<td>9793</td>
<td>80</td>
<td>19719</td>
<td>101</td>
</tr>
<tr>
<td>Government Executive Officials</td>
<td>15336</td>
<td>42969</td>
<td>180</td>
<td>43063</td>
<td>1</td>
</tr>
<tr>
<td>Stenographers, Typists &amp; Teletypists</td>
<td>27182</td>
<td>51102</td>
<td>88</td>
<td>49836</td>
<td>-1</td>
</tr>
<tr>
<td>Card &amp; Tape-punching Machine Operators</td>
<td>1104</td>
<td>755</td>
<td>-32</td>
<td>575</td>
<td>-24</td>
</tr>
<tr>
<td>Bookkeepers, Cashiers &amp; Relative Worker</td>
<td>49025</td>
<td>114208</td>
<td>133</td>
<td>108460</td>
<td>-5</td>
</tr>
<tr>
<td>Bookkeepers, Calculating Machine Operators</td>
<td>1511</td>
<td>245</td>
<td>-84</td>
<td>560</td>
<td>129</td>
</tr>
<tr>
<td>Automatic Data Processing Machine Operator</td>
<td>1038</td>
<td>4690</td>
<td>351</td>
<td>6869</td>
<td>47</td>
</tr>
<tr>
<td>Stock Clerks</td>
<td>17943</td>
<td>47355</td>
<td>164</td>
<td>45621</td>
<td>-4</td>
</tr>
<tr>
<td>Material and Production Planning Clerks</td>
<td>338</td>
<td>1692</td>
<td>401</td>
<td>1300</td>
<td>-23</td>
</tr>
<tr>
<td>Correspondence and Reporting Clerks</td>
<td>67837</td>
<td>161889</td>
<td>139</td>
<td>170249</td>
<td>-5</td>
</tr>
<tr>
<td>Receptionist &amp; Travel Agency Clerks</td>
<td>3182</td>
<td>9894</td>
<td>211</td>
<td>8357</td>
<td>-16</td>
</tr>
<tr>
<td>Library and Filing Clerks</td>
<td>1802</td>
<td>4980</td>
<td>176</td>
<td>4885</td>
<td>-2</td>
</tr>
<tr>
<td>Statistical Clerks</td>
<td>0</td>
<td>1112</td>
<td>845</td>
<td>-26</td>
<td></td>
</tr>
<tr>
<td>Census, Market Research, Related Field Clerk</td>
<td>0</td>
<td>2363</td>
<td>1712</td>
<td>-28</td>
<td></td>
</tr>
<tr>
<td>Clerks NEC</td>
<td>18467</td>
<td>27114</td>
<td>47</td>
<td>26341</td>
<td>-3</td>
</tr>
<tr>
<td>Bookkeeper, Cashiers, Relative Worker NEC</td>
<td>3375</td>
<td>4399</td>
<td>30</td>
<td>4498</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>214393</td>
<td>448334</td>
<td>128</td>
<td>499204</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: 1. Source: Ng, (1992, p15)  
2. Being Calculated into per cent
In addition to the direct demand for new skilled jobs associated with computer-based tasks, Hon (1992: 1819-20) has documented other indirect positive impacts of new technology on creating more jobs. The increased demand for highly skilled workers in jobs associated with computerisation gives educational institutions greater opportunities to open special vocational training and professional courses. In Singapore, for example, since the 1980s, the educational institutions offering special courses which are associated with computer technology have increased. For instance, during the last few years, there are, at least, three educational institutions which have commenced courses associated with computer-based work, that is, the Department of Information and Computer Science and the Institute of Systems Science in the National University of Singapore, and Centre for Computer Studies at Ngee Ann Polytechnic, Singapore.

In Indonesia, a similar phenomenon can be even more convincingly observed. Roughly speaking, most colleges offer many courses related to computer-based skills. This trend has grown massively particularly since many private and public sector organisations installed computers in the late 1970s (see for example a study by McKendrick 1992 on the use and impact of information technology in Indonesian Commercial Banks). The establishment of these educational institutions requires more new jobs in this area. In Singapore (Hon 1992: 1820) for instance, the professional IT workforce has expanded eleven-fold, from about 850 in 1980 to over 10,000 in 1990. In addition, the increased use of computers offers an opportunity to double major skills in the job. In the context of IT, the new professional generations should have a good grounding in both systems analysis and information systems due to current demand and facilities which will force them to do so.

There is also a massive growth of new jobs in other industrial sectors, such as in electronics and electrical companies. In Malaysia, the number of jobs in the electronics industry in ten years increased more than three-fold, from 21,106 in 1973 to 75,698 in 1983, though, the number in 1985 has decreased slightly compared to 1983, from 75,698 to 71,768 (Onn 1989: 86). Sutrisno's (1989: 86-7) study of restructuring in the Malaysian textile industry, found that the introduction of automatic machinery has cut a considerable number of jobs, however, the workers were compensated and relocated into other jobs.

The evidence suggests that, on balance, the introduction of new technology has, through product innovation, created new employment. However, it does not yet indicate its impact in terms of innovation in process. Yun's (1990), study of industrial automation and the transformation of work organisation in West Malaysia, found that in two companies the number of workers decreased from 36 to 27 in one company, while in another jobs decreased from 32 to only 18. Similarly Idris's (1989) study of the electrical light company in Jakarta, found that the installation of new machinery resulted in cutting 66 workers. Further to this evidence, Ng (1992: 14) maintains that many card and tape-punching machine operators, bookkeeping and calculating machine operators have lost their jobs due to computerisation. (For details see table 1 above.)

From the data on the innovation in process and in products, it may be concluded that the impact of new technology on employment is initially negative and later positive. Close examination of the data suggests it is clear that the number of new jobs associated with new technology has generally increased, especially in the services sectors. From these findings, I maintain that new technology in Malaysia, Singapore and Indonesia has an ability to create more jobs. This conclusion may be surprising for those familiar with analyses on the same topic in western countries where the introduction of new technology has been suspected of threatening a nightmare of job insecurity (Brady and Sonia 1985; Wenier, 1956). Therefore, it is important to consider what are the other factors which have successfully positioned this phenomenon?

After reviewing many studies, it seems that there are several points which have together constructed this situation. The first point is related to the reason for introducing new technology. The common logic behind the installation of new technology in Malaysia, Singapore and Indonesia and western countries seems different. Studies in more developed countries have found that the reason for the installation of new technology or automation is to reduce the costs of production and following Taylorist principles, to increase management's control over the work-force (Gordon and Kimball, 1985). However, in the case of Malaysia, Singapore and Indonesia, it appears that the main reason for such change stems from the problem of labour shortage, especially at the skilled level (Yun 1990: 70; Kasali 1990: 11; Fong and Lim 1989: 51). This seems reasonable particularly if we consider the point that Malaysia, Singapore and Indonesia have just stepped up industrialisation programs which already place a high demand for skilled workers.
The second issue concerns the economic situation at the time of introducing significant technological change, such as in the application of information technology in the finance and service industry, (Geok (1989: 59). When this occurs in a period of high growth, the introduction of new technology is less likely to undermine unemployment. If skilled employees are laid off they are likely to have little difficulty in finding other employment.

Related to the economic situation, Geok (1989: 59) argues that, in general, the introduction of new technology in Singapore, for example, took place mainly in new companies and plants set up by multinational companies. A similar phenomenon appears in Indonesia (Wie 1992) and Malaysia (Salih and Young 1989). Wie (1992) found in his study of technology transfer in the manufacturing industry in Indonesia that, in general, the companies adopting new technology were commonly newly established and owned, at least partly, by foreign investors. If the introduction of new technology were mainly in newly established companies, the installation of new technology will certainly not affect anything in terms of job-loss as there were no jobs existing before the installation. The introduction of new technology promotes job creation, particularly in the electrical and electronics industries, textile manufacturing (Onn 1989: 86), metal industries and even in controversial high technology industries. The aircraft industry in Indonesia is a good example, in 1989 it employed more than 15,500 workers (Habibie 1989: 82) most of whom were skilled workers.

The third issue relates to government policy (Aluwie 1989; Geok 1989; Basri 1989; Hing et al 1989; Kasali 1990; Young 1993). According to Aluwie, (1989: 79), by and large, new technology has not had a negative impact on industrial peace in Indonesia. This is because of government policies. First, in "downstream" or labour intensive industries, the use of high technology is very limited; enterprises may not produce more than 30 per cent of their output by machine (Kasali 1990, Young 1993). This policy goes along with another policy which promotes the growth of labour-intensive industries which can absorb the rapid growth of the labour-force. Second, if new technology requires workers to be transferred to other occupations, their wages can not be reduced and the company is responsible for their job relocation. Third, there are strict controls over the termination of employment process where all termination should be approved by government (Department of Human Resources), and finally, dismissed workers should be replaced through the labour market office. In conjunction with this point, Singapore has special policies in anticipation of a catastrophic effect of new technology on the labour force. According to Hing et al (1989: 136), the introduction of new technology is planned and takes time to execute. It then does not affect labour relations or employment suddenly. So as they have argued, introduction has neither destabilised nor seriously affected labour relations. There are other strategies to deal with the effect of new technology on employees and can be attributed to a number of factors (ibid). Companies have responded positively and responsibly when introducing new technology by consulting their employees and offering retraining and redeployment where necessary. Various government policies of promoting new technology has the unremitting support of the unions and employers where consultative mechanisms are in place (Hing et al 1989: 59).

Similarly the Malaysian government applies such regulations to anticipate the negative effect of new technology. The Malaysian Employment (Termination and Lay-off Benefits) Regulation 1980 which has been revised in 1983, says that:

a) The Company agrees to be always mindful of the effects resulting from the introduction of New Technology and undertakes to formulate mutually acceptable policies for implementation so as to maintain and improve industrial harmony; b) The Company also agrees to make every effort to train employees on the processes which take effect from the introduction of New Technology to enable such employees to master skills that have to be maintained; c) in the event the employees are unable to adapt or be trained or re-trained or re-allocated, the Company and the Union shall meet to discuss and decide on the future (Cited from Yun, 1990: 91).

Accompanying the previous clause is a clause 6 which specifies clearly the amount of benefits which an employer is required to pay to terminated employees resulting from the introduction of new technology. This regulation encourages employers to think twice before retrenching workers (Yun 1990: 87).

The final point concerns the social and ideological context of labour relations in these countries. Malaysia, Singapore and Indonesia have typical social values which are distinctive from western countries, most notably employers and employees tend to be unified by familial links and an incorporation principle (Sutrisno 1989; Yun 1990: 

17
87). Moreover, many employees are treated, as in Japanese management systems, as a member of a big business-family. These values are deeply internalised by Malaysian, Singaporean and Indonesian people, and, it follows that employees are generally invited to discuss any plans for technological change. Yun (1990: 87) argues convincingly that professional managers in Malaysia prefer to take a conciliatory stand towards the unions rather than confront them in a bid to avoid burdening themselves with additional problems, such as financial compensation and the bad publicity associated with retrenchment (Salih and Young 1989: 70).

Central to these social values is the workers' attitude toward new technology. In Singapore, workers, in general, do not see that new technology threatens their jobs security. Hing, et al (1989: 136) and Lim (1989: 144) report a similar finding, namely that workers assume that new technology gives them more opportunities to upgrade their skill levels. If there is resistance against new technology, it might rather be due to the lack of worker knowledge of the technology (Marican, 1989: 149) and their poor understanding about the economic environment. In fact workers in Malaysia prefer to volunteer for retrenchment or retirement because they will get suitable compensation (Yun 1990, Fun 1989).

In addition to the previous policies, last, but not least, it may be worthwhile to cite several points delivered by Ng Pock Too, Political Secretary, Office of the Prime Minister and Deputy Secretary-General of Singapore National Trade Union Congress. He said that they (trade unions) accept the need for our (Singapore) industries to automate and upgrade for two reason. Firstly, to relieve the labour shortage and secondly, to remain internationally competitive. We cannot afford to sit back and continue using outdated methods or systems or systems of production while newer, better and cheaper methods are available in the market (cited from ILO, 1989: 4).

He further explained that, trade unions here also accept the fact that automation, robotisation and computerisation will inevitably result in reduction of the workforce. Hence, worker may have to be retrenched. While it is not in the union's interest to resist the introduction of new technology, employers should work closely with their unions to minimise the effects of technological change. They should make it a point to share information with their unions so that workers can be informed in advance about any major changes that could affect them, and thus make the necessary adjustment. To equip the displaced workers with the skills and knowledge needed for the higher skilled jobs created by new technologies and industries, appropriate and adequate training should be provided (ibid)

It is important to elaborate who generally benefits from these rapidly growing sectors of employment. Insofar as the introduction of new technology always requires highly skilled workers, the first group who will gain advantage from new technology is a minority of those who have high qualifications. In less developed countries, skill has been measured by the degree of education. The higher the level of education, the higher the level of skill appreciation. The majority of people who complete their university level are those who come from wealthy families and, therefore, this group is better positioned to take greater advantage of the introduction of new technology. There are as yet no exact statistics which calculates the proportion of skilled workers employed under this category. However, by general observation, they do constitute a high percentage of skilled workers.

Another group taking advantage of a changing labour market in Malaysia, Singapore and Indonesia are foreign skilled workers. Wie (1992: 208, 213) in his study of transnational companies (TNCs) in Indonesia found that every TNC employs between 1 to 6 foreign skilled managers and technical experts. A company established under Australian license, for example, employed three Australian managers and technical experts, while a company established as a joint-venture with a Japanese manufacturing concern employed five managers, three of whom were Japanese. Malaysia employed even more foreign skilled workers. Roni et al (1986: 33), for example, found that a Malaysia-Japan Joint-venture in the electronics industry employed at least 84 Japanese who of course occupied the higher positions in the occupational structure. Of the total number of Japanese employed, 73.5 per cent were managers, 17.2 per cent were either engineers or technicians, and the remainder were consultants. From this simple discussion, it can be suggested that only a minority group of the indigenous people in Southeast Asian countries were better positioned to take advantage from the introduction of new technology, because foreign skilled workers could take more advantage by occupying the higher level of occupational structures.
However, it may be wrong for Malaysian, Singaporean and Indonesian people to blame foreign skilled workers, insofar as they can not compete with them to gain the required qualification. Roni, et al (1986: 37) suggested five constraints acting against the transfer of skills to local workers:

1. language barriers, especially for factory workers; it was also a constraint though less for technicians and engineers;
2. lack of interest and commitment to learn among some workers;
3. high absenteeism and turnover especially among factory workers; but also to a certain extent among technicians and engineers;
4. lack of discipline and dedication; and
5. inadequate time for training.

If this suggestion is true, it is likely that many foreign skilled workers will still be needed to fill the gap in the high status of jobs and consequently many skilled jobs will be taken over by them.

Retrenchment

In this section, I will briefly analyse the impact of new technology on retrenchment. It is widely suggested that the impact of new technology on labour has been somehow positively related to the rate of unemployment. I do not really agree with this suggestion. In my opinion, if the impact of new technology positively relates to the unemployment rate, it is only one factor amongst other aspects which together determine the unemployment rate, such as market conditions and government economic activity.

Geok (1989: 59) in his study argues that in the first half of the 1980s, technological changes have not caused retrenchment in Singapore. In 1983 for example, out of a total 7,500 workers retrenched, only 450 (6%) were due to automation or mechanisation. In the 1985-86 recession, especially during 1985, retrenchment increased considerably. However, of 19,500 cases in 1985, only 1,400 (7.2%) were due to automation or mechanisation. However, in 1986 retrenchment due to automation increased significantly; of 10,000 cases, 27 per cent were attributed to automation. In Malaysia, retrenchment caused by automation is minimal (Basri 1989: 96), and in Indonesia cases of retrenchment are seldom reported.

There are several factors which can explain why retrenchment is likely to be minimal under the impact of new technology. First, as has been pointed out, retrenchment is only the final solution for most disputes in terms of labour relations and second, in Malaysia, the practice of retrenchment might not be clear-cut (Salih and Young, 1989: 71). Third, affected workers especially those with skills often wanted to voluntarily move from their jobs. This factor may be reasonable due to the fact that many semi and skilled workers are needed in other industries. Finally, employers, as noted above, avoid the practice of retrenchment. According to Yun (1990: 88), in Malaysia, many displaced skilled workers whose jobs were absorbed by new automatic machinery were shifted out to less skilled jobs located in other sectors. Many new jobs are less skilled, and many displaced workers leave after they found they could not cope in their new position. As a result, the companies did not have to pay compensation because they left their work by choice.

Deskilling, or Job Displacement

Many studies have suggested that the introduction of new technology will be followed by a deskilling process. To some extent, the findings in Malaysia, Singapore and Indonesia follow Braverman’s deskilling thesis. Yun (1990: 86) has argued that the evidence from his study on industrial automation clearly supports the deskilling process. However, the occurrence of deskilling happens even in the traditional skilled jobs such as painting and winding. Ng (1992: 26-7), has argued that in spite of the fact that automation and computerisation has brought about some changes in work relations, the main obvious change is that jobs become more differentiated, fragmented and diminished into several exclusive sectors.

However, by suggesting the appearance of deskilling phenomenon, this does not say that all levels of employees have experienced the deskilling process with the same consequences. Indeed, different categories of employees are affected differently based on the type of machinery (fully automatic or semi automatic), some employees 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 (Ng 1992; Yun 1990; Salih and Young 1989). For example, Yun (1989: 71) has found that all 19 skilled painters in the printing industry have been eliminated by automation, while in Indonesia, Sutrisno (1989: 87) has found that of 223 semi-skilled winding workers, 30 workers have been affected by mechanisation; the rest of them have been deskilled.

To sum up, the first stage of automation and mechanisation seems, though not always, to be in line with Braverman’s position of a deskilling
process, however, the degree of deskilling depends on the type of work and machine used.

A Simple Comparison between findings in Southeast Asian Countries and England

In this section, I will briefly compare the findings in Malaysia, Singapore and Indonesia with some findings in England12 in terms of the impact on a changing structure of the work-force after the installation new technology. Table 2 surveys workers attitudes toward the introduction of new technology in England with regard to staff numbers. No change was anticipated by half the respondents, while one-third of respondents suggested that the introduction of new technology would reduce jobs; only 8.3 per cent predicted that the new technology would increase jobs.

With respect to skill levels 43.8 per cent of respondents suggested that new technology would not affect any change in skill levels, while 31.2 percent did not state anything. There is an interesting finding here that only 2.1 per cent of respondents predicted that new technology would reduce skill levels, whereas 12.5 per cent suggested that it would increase the skill level. In addition to this, 35.4 per cent of respondent suggested that new technology would create new problems while, 47.9 per cent suggested that it would not create any difficulty.

Table 3 charts the impact of the introduction of new technology in an English study and is concerned with the effect on specific groups of workers. The study focuses on the impact on sets of workers and demonstrates that the higher the level of occupation, the more positive are attitudes toward the use of new technology. For example, the requirement for new skilled staff after introducing new technology concentrates at the top level of the occupational structures. Managerial and professional positions, technical division, and clerical, secretarial and administrative works needed 33.3 per cent of new skilled workers respectively. 25 per cent of new jobs (without any qualification) are offered for managerial and professional position and 33.4 per cent for clerical, secretarial and administrative occupations. Analysing the overall data, Taylor, et al (1986: 281) have generalised their findings by suggesting that new technology did not have general negative effects on employment; the number of jobs often increased and in many cases, staff were upgraded.

In addition, job replacement is more advantageous for people in the highest levels of occupation. For example, the retraining for new skilled jobs was dominated by the three highest ranks in the occupational structure. For example, 24.7 per cent of affected skilled workers from managerial and professional positions were retrained for new skilled jobs, as were 37.6 per cent of clerical, secretarial and administrative workers. Furthermore, managers and professional workers were less likely to experience redundancy compared to workers employed in the technical, clerical, secretarial and administrative occupation. Finally, companies and offices experiencing computerisation show a considerable decline in clerical, secretarial and administrative jobs.

From Table 2, it can be suggested that the expectation of people about new technology seems inconsistent. For example, the response to new technology was sometimes positive and sometimes negative; 33.4 per cent of respondent suggested there would be a reduction of staff numbers due new technology, whereas, only 2.1 per cent suggested the reduction of skill levels in response to new technology in England. Therefore, it seems difficult to assess whether new technology has been or will be experienced either positively or negatively. By and large, the evidence here reflects somehow a rather pessimistic view in regard to new technology. This finding may be considerably explained by a suggestion, that the impact of new technology on the employment structure in England in general differs from Malaysia, Singapore and Indonesia where the demand for skilled labour is still high especially when these countries are intensively promoting the notion of mechanisation, computerisation and automation in order to accelerate economic growth in industrial sectors.

If we look at the overall findings in England and Malaysia, Singapore and Indonesia, it can be suggested that there is, on one hand, some similarity of impact of new technology between these countries. In general, the evidence in these countries supports the thesis of deskilling, particularly in relation to the clerical labour process. In addition, companies in these countries prefer to retrain affected skilled workers to be placed into other skilled, or semi-skilled jobs. However, we could not know whether the retraining policy in England is abused to set up a strategy to avoid the consequence of laying off or retrenching additional workers as has happened in Malaysia.
Study in England

Table 2: Attitudes in Companies Where New Technology is Planned for Introduction (%)

<table>
<thead>
<tr>
<th>No.</th>
<th>Type of Problems</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Effect on Staff Numbers</td>
<td>33.4</td>
<td>8.3</td>
<td>50.0</td>
<td>--</td>
<td>8.3</td>
</tr>
<tr>
<td>2.</td>
<td>Effect on Skill Levels</td>
<td>12.5</td>
<td>2.1</td>
<td>43.8</td>
<td>10.4</td>
<td>31.2</td>
</tr>
<tr>
<td>3.</td>
<td>Whether Problems Anticipated with New Technology Equipment*</td>
<td>35.4*</td>
<td>47.9*</td>
<td>--</td>
<td>--</td>
<td>16.7</td>
</tr>
</tbody>
</table>

Note: Source: Taylor et al (1986, p 55)
1. Likely reduction
2. Likely increase
3. No change expected
4. Staff retrained as necessary
5. Not stated
*1. Problems expected
*2. No Problems expected

Table 3: Impact on Staff, by Skill Level in Companies Using New Technology (%)

<table>
<thead>
<tr>
<th>Type of Impact</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No change in the number of workers from the new technology use</td>
<td>23.0</td>
<td>7.2</td>
<td>12.5</td>
<td>12.5</td>
<td>9.9</td>
<td>8.6</td>
<td>7.2</td>
<td>9.2</td>
<td>9.9</td>
<td>100</td>
</tr>
<tr>
<td>New staff taken on with the skills needed for the technology</td>
<td>33.3</td>
<td>33.3</td>
<td>33.3</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other new staff taken on</td>
<td>25.0</td>
<td>16.7</td>
<td>33.4</td>
<td>8.3</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>8.3</td>
<td>8.3</td>
<td>100</td>
</tr>
<tr>
<td>Existing employees retrained in the new skills needed</td>
<td>24.7</td>
<td>10.8</td>
<td>37.6</td>
<td>9.7</td>
<td>5.4</td>
<td>1.1</td>
<td>4.3</td>
<td>3.2</td>
<td>3.2</td>
<td>100</td>
</tr>
<tr>
<td>Existing employees using the technology without retraining</td>
<td>31.3</td>
<td>9.4</td>
<td>31.3</td>
<td>18.8</td>
<td>6.1</td>
<td>---</td>
<td>3.1</td>
<td>---</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td>Number of employees reduced through natural wastage</td>
<td>8.3</td>
<td>8.3</td>
<td>50.0</td>
<td>16.8</td>
<td>---</td>
<td>---</td>
<td>8.3</td>
<td>8.3</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td>Employees made redundant</td>
<td>9.1</td>
<td>27.3</td>
<td>27.3</td>
<td>9.2</td>
<td>---</td>
<td>---</td>
<td>18.1</td>
<td>9.1</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td>Employees transferred within the company</td>
<td>18.2</td>
<td>18.2</td>
<td>27.2</td>
<td>9.1</td>
<td>9.1</td>
<td>---</td>
<td>9.1</td>
<td>---</td>
<td>9.1</td>
<td>100</td>
</tr>
<tr>
<td>Other</td>
<td>---</td>
<td>---</td>
<td>50.0</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>50.0</td>
<td>---</td>
<td>---</td>
<td>100</td>
</tr>
</tbody>
</table>

*Multiple Answer and Source*, Taylor et al (1986, p 39)

*Note of Categories of Employee
1. Managers and Professional
2. Technicians
3. Clerical, Secretarial and Administrative Workers
4. Sales, Security and Other non-manual Workers
5. Foremen and Supervisors
6. Catering, Hotel Management & other Personal Service Workers
7. Skilled Manual Workers
8. Semi-skilled Manual Workers
9. Unskilled Manual Workers

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The major difference between the findings in England and Malaysia, Singapore and Indonesia is that the English workers demonstrate more negative views about new technology, whereas, workers in these Southeast Asian countries warmly welcome new technology, because according to them it will upgrade their skills and possibly promote them into high levels of managerial and professional occupation. Further to this difference, distinctive cultural and social values have guided Malaysian, Singaporean and Indonesian employers and employees towards solving any disputes with harmonious industrial relations.

Conclusion
This paper has critically examined the effects of new technology on occupational structure and labour relations in Malaysia, Singapore, Indonesia and England. Several points may be suggested here:

(1) In general, the introduction of new technology brings about many positive changes. New technology creates more jobs and thus assists these Southeast Asian countries to accelerate their economic growth and the international competitiveness. The introduction of new technology is positively regarded by employers, employees and the state, and as a consequence, differs from the British experience.

(2) The introduction of new technology in Southeast Asian countries does tend to parallel the experience of more developed countries in terms of the deskilling process and polarisation of certain jobs. Many new jobs appear but often at the expense of traditional skilled jobs. As a result occupational and skill structures become widely differentiated, fragmented, and diminished.

(3) The South-East Asian and British experiences differ with respect to the effects of new technology on labour relations and occupational structures. In England, workers tended to view the use of new technology from a pessimistic stance and with resistance, whereas, in these Southeast Asian countries, new technology offers a bright future of careers in skilled occupations.

(4) Finally, it is very important to treat the effects of new technology in Southeast Asian countries with some caution. These countries have several distinctive factors which have caused different responses to those in more developed countries. To be considered are, reasons for introducing new technology, the way the employers and employees resolve their disputes, local ideology and social values, and more importantly, the economic situation, occupational structure and demand.

Notes
1. I do not want to spend much time on discussing this point, because the debate concerning this finding has been sophisticatedly advanced and well-known. For further examples, see studies conducted by Foley, Watts and Wilson (1992) especially pages 132-3, Kaplinsky (1987) especially pages 73-4, Braverman, (1974) and Forester (ed), (1985).

2. The reports issued by government offices often do not match with many facts. For example, the Aluwie's report (1989, p 79) on behalf of Indonesian government states that there is no cases being reported as being caused by technological change, whether the cases were labour disputes, termination of employment or strike. This seems mismatching with some evidence in Manning's study (1993) which has found some evidence that many workers criticize such a company which mechanize and automate the process of production, for example workers conducted strikes in doing so (see also Idris 1989). This mismatch may be due to such a reality that trade unions there are not active to represent their problems to be reported to government office, or probably the government seems ignorant, therefore, trade unions become reluctant to report their members' problem as far as the government does not respond the complaint fairly. The latter possibility, seems more common.

3. Based on my own research on many literatures and journals, it is difficult to find any studies on this topic except several reports. This can be accepted, if we take a look that the introduction of new technology has been currently promoted especially since the 1970s, when many Southeast Asian countries successfully invited foreign investors and multinational-Joint-Venture companies to participate in their economic development.

4. See for example, studies conducted by Thee Kian Wie (1988), Industrialisasi Indonesia; Analisis dan Cacatan Kritis, (Industrialisation in Indonesia, Critical Analysis and Note), Jakarta, Pustaka Sinar Harapan, especially chapter 3 and 5, and Muchtar (1990). These studies generally focus on the positive impact of new technology from a developmental perspective.

5. In Jakarta, for example, the growth of educational institutions and vocational training which offer special courses in computer sciences either for short term training courses or more academic from undergraduate level to postgraduate has been mushroomed.
6. For example, in the winding sector, the number of manual workers was reduced, from 223 to 193.

7. Cigarette manufacturing, textile and garment industries are considered as labour-intensive industries because they are industrial sectors which can absorb a tremendous number of workers. There was one case seemingly appropriate to mention here. Recently, Indonesian Trade Unions and also the government were critically concerned with such issues related to workers' interest such as the limit of minimum wage. It was reported that the daily wage of manual and unskilled workers, at one of cigarette industry was paying under the minimum wage due to weak market demands. A remaining letter was sent by the government to the company. The alternative solutions proposed by the company are either to mechanise and automate the company so the production costs can be reduced with a warming that many workers will be cut off, or just let the company apply the present policy. The government preferred to choose the latter, because cutting off many jobs may be more catastrophic for the Indonesian economy.

8. Indonesia applies the Pancasila system in industrial relation (Pancasila is the five principles of Indonesian National Philosophy). According to one point of this system, any industrial disputes should be overcome through consultation dialogues or negotiation leading to consensus (musyawarah untuk mufakat).

9. In Japan, the incorporation principle gives birth many 'big-business-families' such as Toyota corporation, whereas in Indonesia, it creates many 'big family-business' (Achmad, et al, 1986, p 11). For further analysis of family-business in Indonesia, see, to mention some references, Richard Robison's; Indonesia: The Rise of Capital, (1986, Sydney: Allen and Unwin), and Muhammed (1990) Bisnis dan Politik; Kebijaksanaan Ekonomi 1950-80, Jakarta, LPJIES.


11. In Indonesia especially, study at a university level, for ordinary people, is a hope which is not easy to be realised particular for such a technical and professional discipline and it often is associated with the privilege of wealthy group, because they can pay university. Indeed, study at state universities is not really expensive, however, the capacity of these universities is very limited to accept all graduate students from various senior high schools. In 1993, the capacity of state universities to absorb new students is less than seventeen percent of the total graduated students from various senior high schools. This means that more than 83 percent of those student should enter to private universities if they want to achieve tertiary education with burden of spending quite a lot of sum up of money. For example, annual fees for taking a degree in computer sciences, electrical and civil engineering, archeticture, exceed about A$1,000. This amount of fees seems unreachably expansive compared to annual income of ordinary people ranging about only A$921.

12. For further information on findings in England, see appendix B

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