<table>
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<th>Title</th>
<th>The computer and knowledge information development in Malaysia : some perspectives</th>
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<tr>
<td>Author(s)</td>
<td>Lim, Huck Tee</td>
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<td>Date</td>
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The Computer And Knowledge Information Development
In Malaysia: Some Perspectives

By

Lim Huck Tee
THE COMPUTER AND KNOWLEDGE INFORMATION
DEVELOPMENT IN MALAYSIA: SOME PERSPECTIVES

by

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Universiti Sains Malaysia
Penang, Malaysia

INTRODUCTION

Since the 1960's many writers have observed that the industrialized countries of the West have experienced a decline in their secondary industries (mainly manufacturing) and a steady rate of growth in their tertiary (mainly service) industries. This phenomenon can best be seen in terms of the contributions of the tertiary sector to employment and the Gross National Product. Scholars have also noted that at least in the industrialized countries more and more workers are becoming involved in information oriented activities.

The growth of the information economy in the United States was first postulated by Fritz Machlup who attempted to measure the production and distribution of knowledge (Machlup, 1962), and since then many attempts have been made to measure the extent of the information economy in the United States. The most well known attempt has been that undertaken by Marc Porat, whose study tried not only to define and measure information activity in the U.S. economy, but also to examine the structure of the information activity with respect to the rest of the economy and the implications occasioned by the evolution of the U.S. economy from one based primarily on manufacturing and industry to one based on knowledge, communication and information (Porat, 1977).

What Porat has termed the "information economy", other scholars and writers have variously called "the postindustrial society" (Bell, 1979), "the Third Wave" (Toffler, 1980), the technetronic age, the electronic era, the space age and so on. Whatever the term used, the central fact is that Western societies and economies are evolving from a goods producing to a service society and that the new intellectual and strategic tool is the computer and its associated technology.

Even in a developing country like Malaysia, the tertiary sector is growing quite rapidly and is beginning to make extensive contributions to the Gross Domestic Product as well as to employment. Table 1 shows the GDP of the Malaysian economy by sector and illustrates quite clearly the declining contribution of the primary agricultural sector and the increasing contributions of the secondary and tertiary sectors. Thus the primary sector's contribution to GDP is expected to decline from 37.1 per cent in 1970 to 17.7 per cent by 1990, while the secondary sector is expected to grow from 17.3 per cent to 31.8
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Sector</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture, forestry &amp; fishing</td>
<td>3,797</td>
<td>5,809</td>
<td>6,720</td>
<td>8,193</td>
</tr>
<tr>
<td>Mining and quarrying</td>
<td>778</td>
<td>1,214</td>
<td>1,607</td>
<td>1,863</td>
</tr>
<tr>
<td><strong>Total Primary</strong></td>
<td>4,575</td>
<td>7,023</td>
<td>8,327</td>
<td>10,056</td>
</tr>
<tr>
<td><strong>Secondary Sector</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>1,650</td>
<td>5,374</td>
<td>9,040</td>
<td>15,121</td>
</tr>
<tr>
<td>Construction</td>
<td>475</td>
<td>1,186</td>
<td>1,824</td>
<td>2,938</td>
</tr>
<tr>
<td><strong>Total Secondary</strong></td>
<td>2,125</td>
<td>6,560</td>
<td>10,864</td>
<td>18,059</td>
</tr>
<tr>
<td><strong>Tertiary Sector</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity, gas and water</td>
<td>229</td>
<td>592</td>
<td>953</td>
<td>1,530</td>
</tr>
<tr>
<td>Transport, storage and communications</td>
<td>581</td>
<td>1,696</td>
<td>2,492</td>
<td>3,834</td>
</tr>
<tr>
<td>Wholesale and retail trade, hotels and restaurants</td>
<td>1,633</td>
<td>3,295</td>
<td>4,841</td>
<td>7,279</td>
</tr>
<tr>
<td>Finance, insurance, real estate and business services</td>
<td>1,036</td>
<td>2,155</td>
<td>3,079</td>
<td>4,629</td>
</tr>
<tr>
<td>Government services</td>
<td>1,367</td>
<td>3,398</td>
<td>5,228</td>
<td>8,044</td>
</tr>
<tr>
<td>Other services</td>
<td>306</td>
<td>637</td>
<td>948</td>
<td>1,459</td>
</tr>
<tr>
<td><strong>Total Tertiary</strong></td>
<td>5,152</td>
<td>11,793</td>
<td>17,541</td>
<td>26,745</td>
</tr>
</tbody>
</table>

*Source:* Fourth Malaysia Plan, 1981-1985
per cent during the same period. Similarly, the tertiary sector will grow from 41.9 per cent to 47.2 per cent. The structural change in the Malaysian economy is also reflected in the rates of growth of occupational employment among the different sectors. Between 1970 and 1980, the proportion of the total workforce in the primary industry declined from 50.5 per cent to 40.6 per cent, while the proportion of the secondary sector workforce increased from 21.4 per cent to 26.5 per cent and the tertiary sector workforce from 28.1 per cent to 32.9 per cent (Fourth Malaysia Plan, 1981-1985, p.91).

However, it is difficult to isolate the information activities of Malaysia's tertiary sector from those of the traditional service industries. It is probably not wrong to assume that the knowledge and information activities (such as banking, the media, publishing, data processing, telecommunications, education, research and libraries) constitute a small proportion of the tertiary sector activities which are still strongly oriented towards what some economists have called the "hard" activities of the traditional service industries (such as transportation, energy utilities, buying and selling, government and other personal services). It is not the intention of this paper to measure the size of the information economy in Malaysia. I do not have the necessary expertise nor sufficient data and time to carry out such a wide ranging exercise. The above discussion is intended to give some idea of the structural changes that are occurring in the Malaysian economy. The sections that follow will focus more narrowly on the twin engines of the information economy - the computer and telecommunications - and their implications for the future of Malaysian society.

**COMPUTER USAGE**

Data about the use of the computer in Malaysia is notoriously unreliable and difficult to obtain. The fact of the matter is that nobody seems to have a clear idea of what is happening, and different sets of data are quoted by various authorities thus making it extremely difficult to determine the reliability of the data.

What is clear is that there has been a sudden and unexpected increase in the use of computers in Malaysia in recent years. A survey carried out recently by the Modernization of Administration and the Manpower Planning Unit (MAMPU) of the Prime Minister's Department showed that the annual growth rate of computers used in government since 1977 is 25 per cent and that the total imported value of computer hardware since 1978 has quadrupled to about M$70 million (U.S.$1.00 = M$2.30). In 1980, the Malaysian Computer Society carried out a survey of the number of computer installations in Malaysia. Of the 420 computer installations that it identified, 320 units (approximately 76 per cent) fell into the category of minicomputers. Mainframe computers numbered about 40 and were projected to reach 100 by 1985. In fact, in the three years since the MCS survey, the
The number of mainframe and minicomputers has increased at a much faster rate than predicted and today they number more than 800 units.

The unreliability of even very informed forecasts is clearly shown in the area of microcomputers. When the Malaysian Computer Society survey was undertaken in 1980, there were only 60 microcomputers used in industry, business and government. It was then projected that the number of microcomputers would increase to 150 units by 1982 and to 450 units by 1985. However, according to S.H. Kon, an official of MAMPU, there were more than 2,166 units of microcomputers and personal computers worth more than M$22.5 million at the end of 1982 (New Straits Times, 10.3.84). How was it possible for the Malaysian Computer Society's forecasts to be so wildly wrong? The steep fall in the price of hardware is one of the principal reasons. In 1980, the price of a microcomputer in Malaysia ranged from M$25,000 to M$100,000. But today it is possible to obtain a small business computer for less than M$10,000. Personal computers cost even less and many can be had for under M$1,000.

The government sector is the largest single consumer of computer technology with about 130 installations in 1980. It has been predicted that this will reach about 200 by the end of 1984. The largest computer system in the government sector is that located in the Prime Minister's Department, which serves several government agencies, including the Treasury, the Economic Planning Unit, the Public Services Department and the Standards and Industrial Research Institute.

The Malaysian Computer Society survey of 1980 gave a breakdown of the locations of the 420 computer systems identified as follows:

- Government: 130
- Wholesale and retail: 66
- Agriculture: 56
- Banking and finance: 53
- Education and research: 37
- Computer services and consultancies: 32
- Manufacturing: 24
- Utilities: 12
- Petroleum and mining: 10

**TELECOMMUNICATIONS**

The spread of computers in Malaysian society, while by no means as rapid as that in a developed country like the U.S. or the United Kingdom, may be regarded as quite spectacular and the number of installations is estimated to increase by 30 per cent per annum. This growth has, however, not been matched by the growth of the other component of the information revolution - telecommunications. Although there has been a demand for better
and more sophisticated telecommunication facilities for a long
time, the Telecoms Department has been relatively slow in
improving the telecommunications system. Currently, the Telecoms
Department maintains and operates two analogue networks which are
used to provide data communication facilities within the country
and overseas. These are the Public Telex Network and the Public
Switched Telephone Network. For a long time, data communications
by computer could only be achieved through leased circuits at
very high costs. However, in 1983 Telecoms introduced a dial-up
service called DATEL which is a switched data transmission
service over the telephone network at a very slow speed of 2400
bps as compared to the leased circuit speed of 9600 bps. The
DATEL service is intended for use by smaller organizations whose
data transmission requirements are not voluminous enough to
justify the cost of a leased circuit. Telecoms has recognized the
inadequacy of the current telephone network for data
communication and is planning to adopt packet switching
technology as the basis for the proposed Public Data Network.
Although no time frame has been mentioned, it is expected that a
Packet Switched Public Data Network will be available in Malaysia
before the end of this decade. The decision of the government to
"privatise" the telecommunications facilities will undoubtedly
lead to better and more efficient systems in the future and will
also encourage the development of computer networks and online
services such as teletext or videotext and other computerized
information services.

COMPUTER PERSONNEL

The sudden and tremendous growth in the use of computers in
Malaysia has not been matched by the necessary increases of
computer personnel, such as systems analysts and programmers.
According to the Economic Planning Unit’s Report of manpower
survey in Malaysia, 1973, there were 115 systems analysts in 1973
and this would increase to 176 by 1980 and 315 by 1990. Like all
other forecasts of the computer industry, this forecast has
proved to be quite wrong, and as early as 1981, according to one
industry source, there existed at least 300 vacancies for
computer personnel (Malaysian business, June 1981, p.14). This
shortage has led to a lot of undesirable consequences such as
job-hopping, uncompleted projects and underutilization of
existing computer resources. The following Table 2 reproduced
from the Report of the Board of Studies for the Establishment of
a School of Computer Science at Universiti Sains Malaysia 1983
shows the estimated requirements for computer personnel until
1990.
TABLE 2. ESTIMATED NEEDS FOR COMPUTER PERSONNEL IN MALAYSIA

<table>
<thead>
<tr>
<th>Year</th>
<th>Cumulative manpower requirements</th>
<th>Additional annual requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>2226</td>
<td>-</td>
</tr>
<tr>
<td>1984</td>
<td>2535</td>
<td>309</td>
</tr>
<tr>
<td>1985</td>
<td>2865</td>
<td>330</td>
</tr>
<tr>
<td>1986</td>
<td>3214</td>
<td>349</td>
</tr>
<tr>
<td>1987</td>
<td>3584</td>
<td>370</td>
</tr>
<tr>
<td>1988</td>
<td>3975</td>
<td>391</td>
</tr>
<tr>
<td>1989</td>
<td>4388</td>
<td>413</td>
</tr>
<tr>
<td>1990</td>
<td>4823</td>
<td>435</td>
</tr>
</tbody>
</table>

The above estimates should be considered as merely indicative of needs because most of the forecasts of manpower needs have proved to be under-estimations. In fact, according to a representative of the Malaysian Computer Society, the demand for computer personnel should increase by about 25 per cent annually. This estimate is only for installations with mainframes and does not include the requirements of those organizations with minicomputers or microcomputers. It also does not take into account any potential leap in the use of computers or new applications other than the normal data processing applications.

Training of computer personnel has been provided at Universiti Sains Malaysia since 1974 through the School of Mathematical Sciences. With effect from the 1984-1985 academic session, training will be provided through a new School of Computer Sciences, and it is expected that about 100 computer scientists will be trained annually by USM. In addition, training is also provided by the other universities at diploma as well as degree levels, by Institut Teknologi Mara, by Intan (Public Administration Institute), and by a large number of private schools and colleges.

**COMPUTER APPLICATIONS**

It is not possible to enumerate or provide a full inventory of all the computer applications in Malaysia. As shown in Table 3, the range of applications is very wide and cover many public and private sector activities. Computers are increasingly being used in banking, finance, insurance, education, publishing, energy utilities, health and medicine, planning, transportation, law enforcement, office automation and management information systems. Most of the applications are in the traditional areas of data processing, although there are some limited applications in more creative areas such as automatic translation, planning, simulation and modelling.
### TABLE 3. SELECTED INVENTORY OF COMPUTER APPLICATIONS IN MALAYSIA

<table>
<thead>
<tr>
<th>APPLICATIONS</th>
<th>EXAMPLES OF IMPLEMENTATION AGENCY</th>
<th>STATUS OF IMPLEMENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BANKING &amp; FINANCE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronic Teller Systems</td>
<td>Hong Kong &amp; Shanghai Banking Corp.</td>
<td>Only in major towns</td>
</tr>
<tr>
<td>Electronic stock exchanges</td>
<td>K.L. Stock Exchange</td>
<td>Only in major towns</td>
</tr>
<tr>
<td>Electronic funds transfer (inter-bank cheque clearing)</td>
<td>Bank Negara</td>
<td>Only in K.L. &amp; Petaling Jaya</td>
</tr>
<tr>
<td><strong>EDUCATION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer-aided instruction</td>
<td>USM</td>
<td>Experimental</td>
</tr>
<tr>
<td>MIS</td>
<td>USM</td>
<td>Planning</td>
</tr>
<tr>
<td>Library techn. MARC files; biblio. search systems</td>
<td>UKM; UPM; UM; USM; Nat. Lib.</td>
<td>Implemented</td>
</tr>
<tr>
<td>Information storage &amp; Retrieval</td>
<td>USM; UPM</td>
<td>Partial</td>
</tr>
<tr>
<td><strong>PUBLISHING</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Newspapers</td>
<td>New Straits Times</td>
<td>Implemented</td>
</tr>
<tr>
<td>Automatic translation</td>
<td>USM &amp; Dewan Bahasa</td>
<td>Under development</td>
</tr>
<tr>
<td>Books &amp; report preparation</td>
<td>All universities; Dewan Bahasa; private publishers</td>
<td>Implemented</td>
</tr>
<tr>
<td><strong>ENERGY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy grid management</td>
<td>National Electricity Board</td>
<td>Implemented</td>
</tr>
</tbody>
</table>
**TABLE 3. SELECTED INVENTORY OF COMPUTER APPLICATIONS IN MALAYSIA (CONT’D)**

<table>
<thead>
<tr>
<th>APPLICATIONS</th>
<th>EXAMPLES OF IMPLEMENTATION AGENCY</th>
<th>STATUS OF IMPLEMENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HEALTH &amp; MEDICINE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital</td>
<td>Min. of Health</td>
<td>Planning</td>
</tr>
<tr>
<td>Drug abuse monitoring</td>
<td>USM</td>
<td>Implemented</td>
</tr>
<tr>
<td><strong>PLANNING AND LAND ADMINISTRATION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIDAS</td>
<td>ICU</td>
<td>Pilot system</td>
</tr>
<tr>
<td>Land data</td>
<td>Min. of Land and Regional Dev.</td>
<td>Planning</td>
</tr>
<tr>
<td>Property information</td>
<td>Municipal Council, Penang</td>
<td>Planning</td>
</tr>
<tr>
<td>Population data</td>
<td>Dept. of Statistics</td>
<td>Implemented</td>
</tr>
<tr>
<td><strong>TRANSPORTATION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airline reservation</td>
<td>MAS</td>
<td>Implemented</td>
</tr>
<tr>
<td>Vehicle and driving licences</td>
<td>Road Transport Dept.</td>
<td>Partial</td>
</tr>
<tr>
<td><strong>LAW ENFORCEMENT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal data</td>
<td>Income Tax Dept.; Public Services Dept.; in some; EPF; National Registration; Police planning in others</td>
<td>Implemented</td>
</tr>
<tr>
<td><strong>OFFICE AUTOMATION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word processing</td>
<td>Most law firms and private companies; some govt. depts.</td>
<td>Implemented</td>
</tr>
</tbody>
</table>

In the sections that follow, a few case studies of actual computer applications will be used to illustrate some of the more important uses of the computer in Malaysia.
THE NIDAS PROJECT

NIDAS is an acronym for a pilot project to develop a national integrated system by the Centre for Policy Research, Universiti Sains Malaysia for the Malaysian Government. The project was first mooted in 1975 by Professor Kamal Salih, then Dean of the School of Social Sciences and Professor K.J. Ratnam, then Director of the Centre for Policy Research (Kamal Salih & Ratnam, 1975). In general, the project attempted to produce a conceptual framework for the integration and the collection of data generated in the course of government activity as well as to develop a computer-based system to process and retrieve the data.

The principal objectives of the project were:

(a) To mobilize and rationalize existing procedures of collecting, storing and processing data resources in the country, in particular the horizontal integration of current information structures into functionally-oriented systems.

(b) To provide a computerized data bank tailored to the needs of planning, monitoring, control, administration and evaluation of public sector activities in development.

(c) To demonstrate the technical, administrative and financial feasibility of an information system for public administration at various levels of government.

The initial allocation by the Federal Government for this pilot project was M$1.5 million, and this was later increased to M$2.2 million. The basic approach taken was to identify the existing available data in various government agencies that could serve as a source of data to NIDAS. The primary files identified included land data, census and population registers, property information, health, education, labour and manpower, development projects and business. Where particular socio-economic data were lacking, a census was carried out. Because of limitations of time and manpower resources, the project originally concentrated on the integration of a selected number of data bases, limited mainly to Penang and Kedah. These included land data, property information, census and population data and data obtained through a socio-economic census. The various operational data bases were linked by a geocoding system which was created by building up a geographic data base containing three directories i.e. Lot Geocode Directory, Geoaddress Directory, and Address Directory. Although retrieval of data was principally through the use of the geocoding grid system, the capability to extract information about individuals was also provided. The project took about three years to complete (1976-1979). But the final report and documentation were not completed until 1981.
The NIDAS Project demonstrated the feasibility of creating an integrated data base using information generated by government activity. However, its full implementation would take time and is dependent on the development of various component data bases by other government agencies. Already activity in this sphere has begun and the principal payoffs of the NIDAS Project have been the planning and development of various computerized land data and property information systems. The staff of the Centre for Policy Research have served as consultants for a number of these projects, including the Klang Valley Regional Planning Information System (Chee, 1982), the Land and Property Information System of the Penang Municipal Council (USM. Centre for Policy Research, 1982a), the Penang Land Data System (Cook, 1982; USM. Centre for Policy Research, 1982b) and the feasibility study for the creation of a computerized land data bank for the Ministry of Land and Regional Development (Malaysia. Ministry of Land and Regional Development, 1983).

The ethical issues relating to the development of a system such as NIDAS, unfortunately, has not exercised the minds of the planners of this system. In their view, the main purpose of NIDAS is the development of information systems which can help the government in its planning and monitoring activities. However, because of the system's ability to integrate information captured by various government agencies about a particular individual (e.g. government personnel records, income tax, land and property information, national registration, health) there are some serious ethical issues relating to the invasion of personal privacy which have to be resolved.

**COMPUTERIZED INFORMATION SYSTEMS**

NIDAS is concerned with the development of computerized information systems for government. Bibliographic and other kinds of information systems have also been developed by the Library, Universiti Sains Malaysia and other institutions. It is not my intention to discuss these in any great detail since an outline of data base activities at USM is provided in the information folder (Rashidah Begum, 1983). Most of the data bases created can now be accessed in the batch mode only. However, the availability of an information retrieval package provided by Unesco called CDS/ISIS will make it possible for the data bases to be accessed online. Currently, insufficient computer resources have been the major obstacle towards the installation of the CDS/ISIS software.

In addition to the Library, the National Drug Research Centre located at Universiti Sains Malaysia has developed a computerized drug monitoring system with data provided by the Police, the Customs, the Ministry of Health, the Prisons Department, the Ministry of Welfare Services and PEMADAM. The objectives of this system are:

(a) To provide current information on the situation of drug abuse in Malaysia.
(b) To identify trends over time and variations between geographical locations.

(c) To utilize information from the system for evaluation, planning and management of national drug abuse programmes.

Brief details of this system and of the Regional Information Centre on Drug Abuse for the W.H.O. Western Pacific Region are also included in the information folder.

COMPUTER APPLICATIONS IN THE PRIVATE SECTOR

So far discussion has dealt mainly with applications in the government and quasi-government sectors. But the private sector is also beginning to use computers extensively, although most of these are either minicomputers or microcomputers. According to the salesmen of computer firms, accounting, inventory control and personnel records represent the normal data processing activities of the private sector. Other DP applications include airline and hotel reservation systems, computer-aided design and other engineering applications, online registration of stocks and shares and manufacturing. According to computer industry sources, the banking sector constitutes the fastest area of growth, for the financial agencies are usually in the forefront in adopting the new information technology.

There are currently 37 banking systems in the country with a branch network of over 600. In a research study undertaken recently Dr. Han found that of the 32 banks that responded to his questionnaire survey, 21 banks had in-house computers, one used a computer bureau service, six were planning computer installations but two had no plans within the next two years to computerize (Han, 1983). Overall the inroad of computers in the commercial banking sector may be considered moderate. Automation was introduced for various reasons, the major ones being improving customer services, meeting competition, improving management reports and savings in operating costs. Most of the banking applications that have been computerized are carried out in the batch mode, although online processing is beginning to be used more extensively. Table 4 shows some of the computer applications in the banking sector.
TABLE 4. COMPUTER APPLICATIONS IN MALAYSIAN BANKS

<table>
<thead>
<tr>
<th>APPLICATIONS</th>
<th>NO. OF BANKS WITH APPLICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>COMPUTERIZED TO BE COMPUTERIZED</td>
</tr>
<tr>
<td></td>
<td>BATCH ONLINE BATCH ONLINE</td>
</tr>
<tr>
<td>ATMS</td>
<td>0 4 0 8</td>
</tr>
<tr>
<td>CREDIT CARDS</td>
<td>4 0 0 1</td>
</tr>
<tr>
<td>BUDGETING</td>
<td>2 1 3 3</td>
</tr>
<tr>
<td>REPORTING</td>
<td>2 0 2 0</td>
</tr>
<tr>
<td>FINANCIAL ANALYSIS</td>
<td>1 0 6 1</td>
</tr>
<tr>
<td>COSTING</td>
<td>1 0 2 0</td>
</tr>
<tr>
<td>PAYROLL</td>
<td>6 2 6 5</td>
</tr>
<tr>
<td>PERSONNEL RECORDS</td>
<td>5 1 5 6</td>
</tr>
<tr>
<td>WAGES &amp; SALARIES</td>
<td>5 1 3 3</td>
</tr>
<tr>
<td>ADMIN. ACCOUNTING</td>
<td>3 0 5 2</td>
</tr>
<tr>
<td>CORPORATE MODELLING</td>
<td>0 0 0 2</td>
</tr>
<tr>
<td>OPERATIONS RESEARCH</td>
<td>0 1 0 0</td>
</tr>
</tbody>
</table>

MICROCOMPUTER APPLICATIONS

The growth in the usage of microcomputers in Malaysia has been nothing short of phenomenal. In 1980, there were less than 100 microcomputers in the country. By 1982, the number had increased to over 2,000 units and the estimated rate of growth is 50 per cent annually. Of course, the number of microcomputer units in Malaysia is only a small fraction of that in the developed countries. In Britain, for example, it has been estimated that one in 25 families have access to microcomputers, while in the U.S. some four million households have microcomputers and it has been forecast that by the year 2000 A.D. most American homes would have microcomputers. The microcomputer has not made the same inroads in Malaysia. Nevertheless, it is quite clear from reports in the media that interest in microcomputers is growing very rapidly. Microcomputers are currently being purchased by small businesses and individuals. Small businesses tend to use the microcomputers for accounting, invoicing, financial planning and word processing. Most of the individuals who have purchased microcomputers, according to computer salesmen, belong to the professional classes or elitist groups. Of the twenty persons who I know own personal computers, nine are university lecturers, four doctors, two pharmacists, one engineer, two librarians, one school teacher and one factory manager. Of the nine university lecturers, four are in the field of mathematics or computer science, but all the others did not have any basic knowledge of computers when they purchased their first microcomputer. In an informal poll that I took, I found that the majority of personal computer owners had purchased the
microcomputers for their children. Like all anxious parents they were concerned that their children should not be left behind in the information revolution. As one would expect, video games represent the major use of microcomputers in these families. However, quite a large proportion use their personal computers as learning tools both for their children and for themselves. Only a handful (mainly doctors) use the microcomputer for accounts, stock keeping and word processing.

SOME SOCIAL AND ECONOMIC ISSUES

The extent of computer penetration in Malaysian society is not very clear. There is definite evidence that its usage is increasing at a very rapid rate. The social problems that computers are likely to raise are less obvious than those associated with some other technologies, for computers do not destroy amenities or injure the physical environment. However, the economic and social effects may initially be quite serious especially for a developing country like Malaysia. Many writers have already written extensively about computers and social change and it is not my intention to rehash their arguments or predictions. Because the socio-economic and political conditions in Malaysia are different from those of many developed countries and because Malaysia will have to rely on imported technology, the issues and problems relating to the introduction and spread of computers and other associated technology in Malaysia will not be identical to those faced by the developed countries. The number of issues that could be discussed is legion. But in this paper, only a few of these issues will be highlighted.

THE EMPLOYMENT PERSPECTIVE

Scientists and sociologists have generally disagreed on the severity of the impact of new technological developments on employment opportunities. Usually, with the introduction of a new technology, the result is what has been called "technological displacement" where individuals with outdated skills are displaced and become unemployable unless they are retrained in the new skills. Pessimists see in the new information technology several threats to workers in the developing countries and their pessimism is based on a number of factors.

With increasing automation and the use of robots in the manufacturing process in the developed world, the traditional advantage of cheap labour that Third World countries have vis-à-vis the industrialized countries will be lost. The availability of cheap labour in Malaysia as well as in many of the ASEAN countries, for example, has resulted in the growth of many labour intensive industries such as textiles and electronics. According to the Malaysian Treasury Economic report, 1983/1984, the electronics industries is one of the faster growing industries in the country. The production of electrical machinery, appliances and electronic components grew by an estimated 50 per cent in
1983. However, within the last one and a half years there has been an increasing trend for the large multinationals to relocate the electronics components industries back in their home countries, because automation and robotics have reduced the comparative advantage of low labour costs that the Third World countries have enjoyed and because the new production methods have made it economically viable to integrate all the manufacturing processes from component assembly to final product at one location.

To get an idea of how serious this trend will be for Malaysia we should note that between 1970 and 1980 Malaysia moved from a situation of labour surplus to one of general labour market tightness because of the growth of labour intensive industries. There were indications of labour shortages in agriculture and in specific manufacturing industries and locations. In all its planning the Government has placed a great deal of hope on the manufacturing sector continuing to be a main source of growth and employment in the 1980’s. If present trends continue, there is every likelihood that this hope will not be realised as Malaysia loses its comparative advantage as a country with low labour costs.

Apart from the threat of unemployment to workers in the manufacturing sector, there is also some fear that workers in the tertiary sector may suffer the consequences of automation. In Malaysia, the tertiary sector has also been an important labour absorbing source. The major employer in this sector is the government. According to the headlines on page one of the New Straits Times, March 11, 1984, the public service employs 1.2 million people, which is 23 per cent of the total national workforce of 5.2 million. This means that about one out of every 4.35 Malaysian is working for the government. The recession coupled with the government’s stated policy of reducing the number of workers in the government service through the privatisation of many of its activities will eventually reduce the role of government as a large source of employment in the future. One way of maintaining productivity with a reduced workforce will definitely be through automation. As we have already shown, the government sector is the largest single user of computers at the present time, and it is likely that the trend towards the increasing use of computers will continue. At the same time, the private sector because of the availability of cheap computers will also intensify its computerization activities to save costs, to provide better customer services and to be able better to withstand competition. Thus a serious situation would arise if the use of computers were to reduce the service industries’ demand for labour just when it was hoped that their expansion would absorb workers displaced from the manufacturing sector by automation.

The consequences of large unemployment of workers in the secondary and tertiary sectors would be far more severe for Malaysia than for the developed countries because there are no social welfare benefits to cushion the impact of unemployment.
Furthermore, there is no strong trade union movement in the country due to restrictive legislation and other reasons, and as a result there is no pressure for management to soften the blow of unemployment as would occur in the developed countries. In the developed countries, because of the strong trade union movement, the introduction of new technology in the factory and in the office by management is seldom accomplished without much resistance from the workers; and only after there is assurance that there will not be severe technological displacements would the workers agree to the introduction of new technology. Management is also often willing to retrain the workers or to provide adequate compensation benefits. This would not occur in Malaysia as firms can generally retrench staff without too much difficulty and multinationals can just pack up and go without bothering about the social consequences that redundancies will create. Moreover, with the loss of agriculture's traditional role as an important source of employment, it can no longer be relied upon to absorb the displaced workers.

If the above scenario turns out to be true then the social dimensions could be quite severe. I think the important point to note is that when new technology was introduced during the industrial revolution, the people who were displaced were those from the lower working classes. However, the information technology revolution will cause a large proportion of white collar workers (the professional, technical, administrative, managerial, clerical and other service workers) to be displaced for the first time. The white collar class has traditionally been a conservative class forming the backbone of most political institutions and governments. They provide the political stability and support so necessary for economic growth and development. As Mills has pointed out, they tend to be apolitical; their "occupational ideology is politically passive; they are not engaged in any economic struggle, except in the most scattered and fragmentary sense...they do not feel any sharp crisis specific to their stratum." (Mills, 1953, p.352) However, should this class be threatened with massive unemployment, its members could become radicalized; and if alienated they could become extremely dangerous to the stability of the political system, for their knowledge and organizational ability would constitute a serious threat to any government. They can become "techno-rebels", like the Luddites of the industrial revolution, and they will question the very basis for the choice of any particular technology that does not serve social and ecological goals (Toffler, 1980, p.167).

The above discussion is of course based on a pessimistic scenario. In real life, the results of any introduction of new technology have always been contradictory. Toffler argues that it is wrong to relate investment in mechanization and automation to levels of employment for there may be no correlation between levels of employment and the introduction of automation. For example, between 1963 and 1973 Japan had the highest rate of investment in new technology, as a percentage of value added, of any country in a seven-nation study. It also had the highest
growth in employment. Britain, whose investment in machinery was
the lowest, showed the greatest loss of jobs. The American
experience roughly paralleled that of Japan, while Sweden,
France, West Germany and Italy all showed markedly individual
patterns. As a result Toffler concludes that: "it is clear that
the level of employment is not merely a reflection of
technological advance. It does not simply rise and fall as we
automate or fail to do so. Employment is the net result of many

THE ECONOMIC PERSPECTIVE

The Malaysian Government inaugurated a new strategy for
development called the New Economic Policy in 1971. This policy
has a two-pronged objective, namely poverty eradication and the
restructuring of society so as to reduce and eventually eliminate
the identification of race with economic function. In this second
pronged objective, the Government has tried to restructure
employment by increasing the representation of Malays and other
indigenous people in the modern sector in line with the racial
composition of population at all levels. It has also tried to
reduce imbalances in the ownership of assets and wealth through
ensuring that at least 30 per cent of the equity capital and
effective management of various enterprises are set aside for
Malays and other indigenous people. The strategy, in other words,
is based on what is appropriate for "second wave civilization" or
the industrial phase of civilization, where the strategic
resource is financial capital. But in the postindustrial or Third
Wave society into which Malaysia will eventually move, the
strategic resource is not financial capital but knowledge and
information. Knowledge and technical competence will become the
main requirements for elite positions in the future and it has
been argued that the knowledge elite will become the
technocratic rulers of society. While it may be some time before
the Malaysian economy becomes largely based on knowledge and
information activities, it might be useful to reexamine the
strategy of the New Economic Policy to see whether or not the
current emphasis on capital acquisition should not be re-oriented
towards that of knowledge acquisition and development. Already
there is some evidence to show that the elite classes in Malaysia
are poised to take advantage of Malaysia's eventual evolution
into an information economy. Laver has argued that:

"The advance of information technology...could make the
information-rich even richer, and widen the gulf between
them and the information-poor. This is a troublesome
possibility because the information-poor will tend to be
those who are also deprived economically and educationally,
and who are thus most in need of the benefits that better
information could bring. It seems likely that the provision
of improved information services will be divisive between
human and social groups, even though it is at the same time
integrative between institutions and organizations." (Laver,
1980, p. 20)
THE POLICY PERSPECTIVE

Considering the potential impact of computers and telecommunications on society, there has been surprisingly little discussion on the policy implications of the new information technology. Not only is there no national information policy but there is also no policy relating to the use of the new information technology which has crept willy-nilly into all spheres of government and private sector activities. Because the Malaysian economy is relatively internationalized, and because the government is very keen to privatise some of its activities, it is unlikely that restrictions will be placed on the use and import of computer technology. In spite of this, there are many policy issues to be considered. Porat has pointed out that:

"The rapid diffusion of computer and communication technologies carries tremendous force, as evinced by the changes following the diffusion of industrial technologies. With each new application of information technology, economic or social tensions may surface. Some might be resolved by market forces, common sense or luck. But many more, not easily soluble or analytically obvious, will rise to the level of policy issues." (Porat, 1977, p. 205).

In societies where there is a tendency towards more authoritarian forms of government, the advent of the new information technology poses both a challenge and an opportunity. Governments in developing countries have traditionally been keen to filter and censor information. While this may be politically motivated, it is also partly altruistic stemming from the desire to protect the citizenry from the more degrading aspects of foreign culture and partly nationalistic arising out of the desire to shape the thoughts and culture of the citizens through the selective dissemination of "appropriate" information. But the new information technologies will make it extremely difficult for government to control the dissemination of information. Already the influx of video tapes from other countries has created problems for the government in its effort to build a nation based on a common set of values, language and culture. Current improvements in the technology of small disk antennas will also make it easier for the citizens of a country to tune in to foreign TV programmes in the future. In the same way, anyone in Malaysia with a microcomputer could conceivably gain access (in the not too distant future) to any foreign information source or data base. In such a situation what policies should government adopt in respect of information access?

Another important policy issue that is likely to crop up relates to the use of computers by government to limit individual freedom, to monitor and to control. The NIDAS system actually contains the seeds of such a control system, although it was originally developed for planning and project monitoring.
purposes. The temptation to develop systems to police and undertake political surveillance is more likely to occur in societies which are subject to authoritarian controls, and the sophisticated advances in information processing technology will make it relatively easy to develop such systems. It is therefore important that in the developing countries where democracy is still practised some form of institutional or legal restraint should be available to check bureaucractic abuse. The impact of the new information technology across all sectors of the economy and society is too important to be left solely to market forces or to a handful of technocrats or ideologues. Policies regarding its use should be the concern and require the participation of an informed citizenry.

CONCLUDING REMARKS

There are obviously many issues that could be discussed. And one could write a whole book on these issues. I have highlighted what I believe to be important issues in the context of Malaysia. What is important to realise is that the computer is not the panacea for all ills and that it cannot solve the human condition if there is no political will. Finally, I think that like Joseph Weizenbaum, Professor of computer science at MIT, one should maintain a healthy scepticism regarding all the euphoric prophecies about the benefits of computers to civilization. I would like to conclude by quoting him extensively:

"The computer in its modern form was born from the womb of the military...computers were first constructed in order to enable efficient calculation of how most precisely and effectively to drop artillery shells in order to kill people. It is probably a fair guess, although no one could possibly know, that a very considerable fraction of computers devoted to a single purpose today are still those dedicated to cheaper, more nearly certain ways to kill ever larger numbers of human beings.

What then can we expect from this strange fruit of the human genius? We can expect the kind of euphoric forecasting and assessment with which the popular and some of the scientific literature is so abundantly filled. This has nothing to do with computers per se...We can also expect that the very intellectuals to whom we might reasonably look for lucid analysis and understanding of the impact of the computer on our world, the computer scientists and other scholars who claim to have made themselves authorities in this area, will, on the whole, see the emperor's new clothes more vividly than anyone else...Some of us will find their accounts unrealistic, not because of mere differences of opinion but because their accounts are plainly silly...

It is not necessary to credit computers for accomplishments with which they have nothing to do. They can be realistically credited with having made possible some easing of the lives of some people...Many...examples could
be given of how and in what ways the computer has done some
good. But some questions are almost never asked, such as,
Who is the beneficiary of our much-advertised technological
progress and who are its victims? What limits ought we, the
people generally and scientists and engineers particularly,
to impose on the application of computation to human
affairs? What is the impact of the computer, not only on
the economies of the world or on the war potential of
nations and so on, but on the self-image of human beings and
on human dignity? What irreversible forces is our worship of
high technology, symbolized most starkly by the computer,
bringing into play? Will our children be able to live with
the world we are here and now constructing? Much depends on
the answers to these questions.” (Weizenbaum, 1979, p.456-
457).
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