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SECTORAL PROJECTION OF MANPOWER NEEDS IN MALAYSIA

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1. INTRODUCTION

One of the major challenges in the 1990s is to shift the focus of policy making from economic growth and employment generation to human resource development (HRD). HRD is at the moment most widely discussed in both international and national meetings. Lucas and Verry (1989), in their discussion on human resource led development and labour options for Malaysia, highlighted that human resource accumulation presumably shifts the Malaysian economy's comparative advantage towards human resource intensive products just as physical capital investment would shift an economy to more capital intensity.

The conventional approach to employment strategies in this region has been to promote rapid economic growth in production lines which can productively absorb a lot of labour. The labour absorption strategy is based on utilising unskilled workers which undoubtedly leads to employment creation, but it is vulnerable to technology and organisation changes. In addition, it is also sensitive to changes in relative wage levels. The difference in the human resource-driven strategy is the competitive edge of the economy, neither the commodities nor the cheap labour, but skills, entrepreneurship and research. What has happened in the first tier of the NIEs in Asia - in Korea, Singapore and Hong Kong - is that those economies have shifted from labour-based lines of production to more skills and entrepreneurship-intensive technologies (Edgren, 1990). The extent to which they can be called HRD-driven strategies varies, but it is quite clear that the shift towards skills and innovation is one of the explanations why the second line of flying geese has continued to move so fast inspite of emerging labour shortages and rising wage levels, such as in the case of Malaysia. The proof of the HRD-based development strategy is that the structural transformation of the economy is facilitated by arising quality of labour supply, and not primarily by overseas demand factors.

Manpower planning in Malaysia has been accorded top priority as an instrument of employment and socio-economic restructuring since the implementation of the NEP. Each Five-Year Plan has devoted extensive coverage to manpower planning, with elaborate statistical information relating to NEP manpower targets and performance in terms of restructuring, However, Malaysian manpower planning suffers from a fundamental inconsistency with economic planning and policy. The principal task of manpower planning in Malaysia had been centred on employment restructuring under the NEP (Ozay Mehmet, 1989). This task, unfortunately, had been implemented independently of investment and resource allocation, most notably insofar as the private sector is concerned.

It is, therefore, crucial and critical to make competent manpower projections to facilitate manpower planning to assess and monitor training needs for effective HRD-driven growth strategy. Several approaches have been adopted in estimating manpower requirements. Some of the conventional methods are: manpower requirements approach (MRA), rate of return analysis and employer survey method.

Estimates of manpower demand usually employ the manpower requirements approach, which rely on estimates of the labour-output ratio, derived from historical series, and assumed to grow at a certain rate reflecting a rising productivity of labour. The labour-output coefficients by sectors,

or a variation using employment elasticity measures, are then applied to projected sectoral national output to give future projections of new jobs required to achieve the output. These projections of skills or labour requirements are then matched against estimates of supply at the various levels to provide a relatively crude measure of the supply gap. MRA is, therefore, used primarily to determine the relative supply of knowledge- and skill based workers. In Malaysia, this method of projecting manpower needs has been utilised since the early 1970s to estimate different types of manpower.

Manpower requirements approach has been criticised for being subject to wide errors of estimation, and should be treated as indicative rather than deterministic of the eventual demand. Alternative methods such as rate of return method and employer survey should be used to supplement these projections. The manpower requirements approach, less demanding of data than labour market studies, however, provides a macro-level picture of the magnitude of the skills problem.

The rate of return analysis, on the other hand, attempts to estimate the private and social rates of returns from investments in education or human capital formation. Investment costs include direct costs such as teaching personnel, building, equipment, materials as well as indirect costs such as the opportunity cost incurred during training period. The rate of return analysis demands a more comprehensive database which is usually lacking in many countries, with no exception in Malaysia.

The employer survey method is possibly the oldest and most direct method of assessing the training needs by asking establishments to estimate the manpower they require within a specified period. This method is more commonly used as a supplementary analysis to the MRA method to provide a better picture to the macro-level manpower projections.

2. PAST ATTEMPTS IN MANPOWER REQUIREMENT FORECAST

Recognising the need for figures in planning purposes, the Government had, in the past, attempted to forecast manpower requirements at the national level. These projections had been useful to a certain extent in highlighting the growing important of skills needed for the medium- and long-term, especially for the professional, technical and production workers. Some of the efforts done in forecasting manpower needs at the national level are:

i) *Manpower Survey 1965*: This was a national-wide employer survey. Employers were asked to estimate their manpower requirements for the next five years. In addition, information on the available stock of manpower, the extent of shortages and the employment of foreign workers were obtained.

ii) *Manpower Survey 1973*: This survey was conducted in different stages to cover both the private and public sectors in Peninsular Malaysia, Sabah and Sarawak. It formed the first comprehensive effort at long-range manpower forecasting in the medium- and long-term. The medium-term forecast was based on employers' assessment of their future manpower needs from mid- 1973 over the next consecutive 2-3 years. To complement this assessment, an analysis was undertaken to project the nation's long-term manpower requirements for 1980 and 1990, using the MRA method.

iii) *Towards a Master Plan on Manpower Demand*: This report was prepared by MAMPU. The projections were based on the revised estimates of the Manpower Survey 1973 and the parameters of the 1980 Population Census.

iv) *Industrial Master Plan on Manpower and Training (IMP)*: The projection method used in the IMP to forecast manpower demand for selected manufacturing industries moved away from the conventional manpower requirement approach. Instead, it used the so-called

"target approach", in which various targets on economic growth, productivity levels and skill proportions were established to set the broad parameters for manpower projections. Based on these targets, the IMP then proceeded to estimate the requirements for engineers and technicians at 3-digit occupational level and production and process workers at 2-digit occupational level. It envisaged a rapid expansion of engineers and technicians (with a target of quadrupling their share in the manufacturing workforce during the plan period) as a critical element to attain an 8 per cent productivity growth annually. These projections were confined only to twelve selected manufacturing industries.

3. DATA PROBLEMS

To estimate the sectoral manpower needs, it is necessary to have comparable data on both the supply and demand for labour. The available data on the demand side are scarce, and at best sketchy. They tend to be more case by case studies of various industries providing qualitative type information. The supply side, the providers of such manpower are mainly the educational and training institutions from both the public and private sector and some in-house training carried out by individual companies. Even in this area data are limited.

Bearing in mind the severe limitation imposed by not having a database for the Malaysian labour market, an attempt is made to estimate the difference between the current production of skills and the demand for them. Because it is a very dynamic situation where even current needs are largely unmet, the rapid economic growth experienced by Malaysia would imply a widening of the skills gap with detrimental effect on the potential growth of the economy.

4. SECTORAL PROJECTIONS OF THE OVERALL OCCUPATIONAL SCENARIO

The occupational scenario under the Second Outline Perspective Plan, 1991-2000 (OPP2) envisages the fastest growing occupations to be those in the professional and technical, administrative and managerial, sales and production categories in line with the growth in the manufacturing and tertiary sector activities as shown in Table 1. In the professional and technical category, about 48 per cent of the total new jobs will be created at the technicians level. With the continuation of the present upgrading of production technology from the simple assembly and process type operations to more sophisticated and automated processes, there will be an increase in demand for about 153,000 engineers and engineering assistants over 1991-2000. This demand will be more pronounced in the civil, mechanical, electrical and electronics, industrial and design fields. In view of the commitment of the Government towards maintaining and upgrading the quality of education and health care for the population, the demand for teachers and doctors and other medical personnel will remain high as indicated in Table 2.

Using our own assumptions about macroeconomic growth, and independent estimates of labour-output coefficients, along with the assumptions on labour productivity growth, MIER projected the labour requirements for the various sectors as presented in Table 3. Then, using an estimated industry/occupation matrix for 1991, the labour requirements were further broken down according to skill categories (Table 4).

The results were compared with the OPP2 targets. As can be seen from the last columns of Table 1, MIER projected an annual growth rate of 9.5 per cent for professional and technical manpower during 1991-95 concomitant with the Sixth Malaysia Plan period. This is a much higher projected requirement compared with the 4.7 per cent estimated by the Government for the same period. Service and production workers, a good proportion of whom would be skilled and semi-skilled workers, were projected to grow at 6.7 and 7.5 per cent respectively, compared to the OPP2 figures of 4.0 and 4.5 per cent, respectively. Corollary to that, it can be seen that a far greater number

Table 1

Occupational Structure, 1990-2000

Occupational Groups	Opp2/6MP 1990 ('000)	(%)	1995 ('000)	(%)	2000 ('000)	(%)	Net Increase ('000) 1991-95	1996-2000	MIER 1995 ('000) Total	Net Increase	Diff.[2]	Average Annual Growth Rate (%) 91-95	96-2000	MIER 91-95
Professional and Technical	580.8	8.8	732.2	9.4	900.8	10.0	151.4	168.6	884.6	303.8	152.4	4.7	4.2	9.5
Administrative and Managerial	162.4	2.4	219.5	2.8	263.7	2.9	57.1	44.2	235.5	73.1	16	6.2	3.7	9.1
Clerical	645.9	9.8	767.1	9.9	891.3	10.0	121.2	124.2	737.3	91.4	-29.8	3.5	3.0	0.8
Sales	761.3	11.5	973.9	12.6	1,243.2	13.8	212.6	269.3	857.2	95.9	-116.7	5.0	5.0	5.2
Services	770.3	11.6	937.7	12.1	1,131.5	12.6	167.4	193.8	1154.2	383.9	216.5	4.0	3.8	6.7
Agricultural [1]	1,872.5	28.3	1,846.6	23.8	1,818.2	20.2	-25.9	-28.4	1721.9	-150.6	-124.7	-0.3	-0.3	-1.6
Production	1,827.8	27.6	2275.4	29.4	2,737.6	30.5	447.6	462.2	2568.7	740.9	293.3	4.5	3.8	7.5
TOTAL	6,621.0	100.0	7752.3	100.0	8,986.3	100.0	1,131.3	1,233.9	8159.4	1,538.4	402.4	3.2	3.0	4.8

Source: Malaysia, Government of (1991) **Sixth Malaysia Plan, 1991-95**. National Printing Department, Kuala Lumpur.
Malaysia, Government of (1991) **Second Outline Perspective Plan, 1991-2000**. National printing Department, Kuala Lumpur.

Note: [1] Negative growth of this occupational group is due to a net reduction in job creation in the agriculture sector.
[2] The difference is calculated by subtracting the government figures for the net increase of the respective manpower from MIER's projected net increase.

Table 2

Capacity of Local Institutions to meet the Demands for Selected Professional and Technical Occupations 1991-2000

Occupation	Stock 1990	Employment 2000	Net Increase 1991 - 2000	Output (1991-2000)[1]	
				Local Public	Local Private
ENGINEERS	**26,500**	**56,600**	**30,100**	**21,000**	-
Civil	11,100	19,500	8,400	3,700	-
Electrical & Electronic	6,200	14,600	8,400	4,200	-
Mechanical	5,200	10,800	5,600	4,000	-
Chemical	800	2,000	1,200	900	-
Others	3,200	9,700	6,500	8,200	-
ENGINEERING ASSISTANTS	**72,400**	**195,300**	**122,900**	**84,070**	**20,900**
Civil	27,100	58,500	31,400	20,400	600
Electrical & Electronic	32,300	75,900	43,600	21,200	8,800
Mechanical	6,400	32,400	26,000	11,600	9,600
Chemical	600	6,000	5,400	570	-
Others	6,000	22,500	16,500	30,300	1,900
MEDICAL AND HEALTH	**11,600**	**17,600**	**6,000**	**6,200**	-
Physicians & Surgeons	7,900	12,300	4,400	4,600	-
Dental Surgeons	1,700	2,200	500	700	-
Pharmacists	2,000	3,100	1,100	900	-
MEDICAL AND HEALTH ASSISTANTS	**47,300**	**57,400**	**10,100**	**5,660**	**1,050**
Medical & Lab. Med. Assts.	9,500	13,000	3,500	1,000	-
Dentists & Dental Nurses	2,000	2,700	700	200	-
Pharmaceutical Assts.	1,500	2,400	900	360	-
Professional Nurses	34,300	39,300	5,000	4,100	1,050
SCHOOL TEACHERS	**177,600**	**252,500**	**74,900**	**74,900**	-

Source: Second Outline Perspective Plan, p.167.

Note: [1] output does not include graduates from education and training institutions overseas.

Table 3
MIER: Projection of Labour Requirement by Sector, 1990-2000

Industry	Lab/Output Ratio (1990)	Lab/Output Ratio (1995)	Projected Output ($mil) 1990	1991	1992	1993	1994	1995	2000	Projected Labour Requirement ('000) 1990	1991	1992	1993	1994	1995	2000
Agri, Forestry, Hunting & Fish.	.000125	.000085	14,550	15,147	15,597	16,254	17,049	17,940	19,673	1,838	1,819	1,815	1,761	1,758	1,752	1,585
Mining and Quarrying	.000004	.000004	9,503	10,147	10,672	11,570	12,687	13,300	15,860	39	40	42	46	48	54	64
Manufacturing	.000020	.000018	65,116	72,035	78,260	85,711	94,553	104,372	150,628	1,290	1,365	1,473	1,576	1,671	1,867	2,694
Construction	.000037	.000033	11,605	12,789	13,926	15,229	16,731	18,303	23,372	427	449	487	538	566	604	772
Transp., Storage & Communication	.000036	.000035	7,965	8,541	9,013	9,534	10,330	11,252	16,816	285	286	307	328	341	398	595
Fin, Insurance, Real Est. & Bus. Ser.	.000033	.000049	6,977	7,444	7,826	8,245	8,757	9,387	12,192	231	261	295	334	377	460	597
Services*	.000073	.000065	34,617	36,937	38,831	40,913	43,626	46,523	51,490	2,510	2,567	2,675	2,848	2,911	3,024	3,347
Total	.000044	.000035	150,333	163,040	174,125	187,456	203,733	221,077	290,031	6,621	6,766	7,094	7,430	7,671	8,159	9,655

Note: * Include Government Services and other non-Government Services (utilities, Wholesale and Retail and Restaurants etc.)

Table 4

Projection of Labour Requirement by Skills Category, 1991-95

Industry/Occupation Matrix (1991)

	Prof.,Tech & Rel.	Adm & Man	Clerical	Sales	Services	Agri. Workers	Prod. & Rel.	Total
Agri, Forestry, Hunting & Fish.	7,213	3,917	13,855	459	7,171	1,713,809	72,822	1,819,247
Mining and Quarrying	1,086	2,034	2,899	879	1,475	799	30,893	40,065
Manufacturing	24,711	55,153	95,658	118,969	16,047	15,599	1,039,346	1,365,484
Construction	9,826	35,540	19,618	6,169	3,990	2,672	371,200	449,015
Transp., Storage & Communication	10,442	10,002	60,413	15,971	4,693	9,852	175,287	286,661
Fin, Insurance, Real Est. & Bus. Ser.	1,190	4,840	781	219,636	2,371	1,849	8,183	234,850
Services*	539,487	53,777	531,052	392,522	751,289	91,742	207,264	2,567,132
Total	593,956	165,263	724,277	754,606	787,035	1,836,322	1,904,995	6,766,454
	8.8	2.4	10.7	11.2	11.6	27.1	28.2	100.0

Industry/Occupation Matrix (1995)

	Prof.,Tech & Rel.	Adm & Man	Clerical	Sales	Services	Agri. Workers	Prod. & Rel.	Total
Agri, Forestry, Hunting & Fish.	7,339	5,022	67,985	363	7,370	1,587,632	76,251	1,751,961
Mining and Quarrying	1,232	2,528	11,413	806	1,865	862	35,381	54,087
Manufacturing	35,446	79,434	57,987	173,338	22,425	18,610	1,479,632	1,866,871
Construction	12,707	48,902	84,354	7,883	5,249	3,077	442,211	604,383
Transp., Storage & Communication	12,583	9,928	225,819	3,169	3,101	399	142,991	397,989
Fin, Insurance, Real Est. & Bus. Ser.	1,126	3,898	32,635	415,796	2,024	1,097	3,678	460,254
Services*	814,148	85,794	257,093	255,840	1,112,195	110,299	388,550	3,023,920
Total	884,580	235,505	737,285	857,196	1,154,228	1,721,976	2,568,693	8,159,464
	10.8	2.9	9.0	10.5	14.1	21.1	31.5	100.0

Note: * Include Government Services and other non-Government Services (utilities, Wholesale and Retail and Restaurants etc.)

is expected to move out of agriculture than the OPP2 projections for the same period. And in sales, MIER's projected net increase is much less than the OPP2 projections.

In terms of sectoral forecast, MIER projected that the manufacturing, construction and financial, real estate and business services sectors require a much greater number of manpower than that projected in the OPP2 (Table 5). For instance, MIER projected the manufacturing sector to demand approximately 1.9 million workers by 1995, a net increase of 576,700 workers from that of the 1990; a difference of about 170,000 workers from the OPP2 projection. The employment in the construction is projected to grow at an annual rate of 5.2 per cent to reach at 604,400 workers by 1995, recording a net increase of about 180,000 workers. The fast growing finance, insurance, real estate and business services sector sees an even higher number in MIER estimates - a 100 per cent increase!

Among sectors that are below the official projections are the agricultural and forestry sector; and government services (including utilities, wholesale and retail trades). This implies that manpower requirements in these two sectors are projected to decline at a faster pace than the official projections for the same period.

These numbers are not sacrosanct; they are dependent on the assumptions used in the projections. A higher labour productivity growth would reduce the required figure for the period concerned. Market behaviour assumptions, especially if one incorporates lags between production of skills and changes in market demand for skills, would also affect the projections.

The essence of the projections is in showing the relative magnitude of the required manpower. This is especially relevant when matched with the supply capacity in the production of skills at the various occupational levels and sectors. Table 2 shows the capacity of local institutions to meet the projected demand in the engineering, medical and teaching profession. Except for school teachers, public institutions are not able to cope with the requirements in most occupations, and have to be supplemented by the private sector and from overseas. As can be seen, the shortfall in supply is most acute in the engineering skills. Given the growth forecasts and the industrial restructuring that is envisaged in the MIER estimates, and as called for in the OPP2, the skills gap in the engineering, technical and vocational fields would be far higher.

5. SUPPLY OF VOCATIONAL AND TECHNICAL MANPOWER FROM THE SCHOOL SYSTEM

Over the period 1986-90, output from public training increased by 48.3 per cent (Table 6). Total output for technical and vocational graduates for the past five years was 61,596. This number is expected to leap to 113,937 over the next five years or a 43.1 per cent increase over 1991-95. Despite efforts made, the imbalance and inadequacies in the enrolment and output from the vocational and technical areas remain.

Output of Degree- and Diploma-holders

The output of degree- and diploma-holders from local institutions over the period 1981-95 is presented in Table 7. The output combination is rather unbalanced implying the inadequacies in the ad hoc-type educational planning. It is ironical that the percentage of science and technical graduates is envisaged to deteriorate from 47.4 per cent during the Fifth Malaysia Plan period to 39.3 per cent during the Sixth Plan period, while the country is leaping forward to high-tech production processes which involve NC, CNC, highly automatic and robotic processes.

Proportions of arts graduates continued to dominate output from tertiary institutions and their share, instead of declining, had increased by 3 percentage points between the Fourth Plan and Fifth Plan periods, and this gap is anticipated to widen by the end of the Sixth Plan, down by 8.1

Table 5
Employment by Sector and Labour Force, 1990-2000

Sector	OPP2/6MP 1990 ('000)	1990 (%)	1995 ('000)	1995 (%)	2000 ('000)	2000 (%)	Net Increase ('000) 1991-95	Net Increase ('000) 1996-2000	MIER 1995 ('000) Total	MIER 1995 ('000) Net Increase 1991-95	MIER 1995 ('000) Diff.	Average Annual Growth Rate (%) OPP2/6MP 91-95	OPP2/6MP 96-2000	MIER 91-95	MIER 96-2000
Agri. & Forestry	1,837.6	27.8	1,821.9	23.5	1,799.9	20.0	-15.7	-22	1751.9	-85.7	-70	-0.2	-0.2	-0.9	-1.9
Mining & Quarrying	39.1	0.6	40.7	0.5	42.3	0.5	1.6	1.6	54.1	15	13.4	0.8	0.8	7.8	3.6
Manufacturing	1,290.2	19.5	1,699.1	21.9	2,143.9	23.9	408.9	444.8	1866.9	576.7	167.8	5.7	4.8	8.1	7.6
Construction	426.9	6.4	547.5	7.1	664.4	7.4	120.6	116.9	604.4	177.5	56.9	5.2	4.0	5.1	5.0
Transp., Storage & Communication	285.4	4.3	345.4	4.5	410.5	4.6	60	65.1	398.0	112.6	52.6	3.9	3.5	8.5	8.4
Fin., Ins., Real Est. & Business Ser	231.3	3.5	273.2	3.5	306.5	3.4	41.9	33.3	460.3	229.0	187.1	3.4	2.3	4.2	5.3
Services*	2,510.5	37.9	3,024.5	39.0	3,618.8	40.2	514.0	594.3	3023.9	513.4	-0.6	3.8	3.7	3.6	2.1
Total	6,621.0	100.0	7,752.3	100.0	8,986.3	100.0	1131.3	1234.0	8,159.4	1,538.4	407.2	3.2	3.0	4.8	3.4
Labour Force ('000)	7,046.5		8,114.0		9,364.5		1,067.5	1,250.5				3.1	2.9		
Unemployment ('000)	425.5		361.7		378.2										
Unemployment Rate (%)	6.0		4.5		4.0										

Source: Malaysia, Government of (1991) **Sixth Malaysia Plan, 1991-1995**. National Printing Department, Kuala Lumpur: 28.
Malaysia, Government of (1991) **Second Outline Perspective Plan, 1991-2000**. National Printing Department, Kuala Lumpur.
Note: * Include Government Services and other non-government services (utilities, wholesale and retail and restaurants etc).

Table 6
Output of Graduates and Students from the Public Vacational Schools, Polytechnics and Technical Schools, 1986-1995

Public Institutions	1986	1987	1988	1989	1990	Total amount 1986-1990	1991	1992	1993	1994	1995	Total amount (expected) 1991-1995
Vocational schools	5,269	6,806	7,473	7,541	9,623	36,712	11,550	11,490	14,090	14,090	14,090	65,310
Polytechnics	1,795	1,695	2,176	2,587	2,621	10,874	3,293	4,672	7,380	8,302	8,302	32,029
Technical schools	3,028	2,857	2,643	2,735	2,726	14,010	3,158	3,360	3,360	3,360	3,360	16,598
Total	10,092	11,358	12,292	12,863	14,970	61,596	18,001	19,522	24,830	25,752	25,752	113,937

Source: Ministry of Education and Ministry of Human Resources, 1991.

Table 7
Malaysia : Output of Degree- and Diploma-Holders by Course from Local Institutions

Course	Output			% Increase	
	4MP Period	5MP Period	6MP Period (Expected)	5MP Period	6MP Period (Expected)
DEGREE LEVEL					
Arts	**14,982**	**27,780**	**50,250**	**85.4**	**80.9**
(%)	**55.5**	**52.6**	**60.7**		
Arts & Humanities[1]	8,753	14,580	25,630	66.6	75.8
Economics & Business [2]	5,775	12,170	21,390	110.7	75.8
Law	454	1030	3230	126.9	213.6
Science	**9,317**	**17,510**	**21,110**	**87.9**	**20.6**
(%)	**34.5**	**33.1**	**25.5**		
Medicine & Dentistry	1,290	2,280	3,190	76.7	39.9
Agriculture & Related Sciences [3]	1,037	1,730	2,130	66.8	23.1
Pure Sciences [4]	3,442	3,170	6,430	-7.9	102.8
Others [5]	3,548	10,330	9,360	191.1	-9.4
Technical	**2,719**	**7,550**	**11,430**	**177.7**	**51.4**
(%)	**10.1**	**14.3**	**13.8**		
Engineering	1,780	5,360	9,210	201.1	71.8
Architecture & Town Planning	457	1,070	1,450	134.1	35.5
Surveying	285	410	480	43.9	17.1
Others [6]	197	710	290	260.4	-59.2
Degree Total	27,018	52,840	82,790	95.6	56.7
DIPLOMA LEVEL					
Arts	**9,808**	**18,450**	**29,970**	**88.1**	**62.4**
(%)	**42.9**	**47.7**	**53.3**		
Arts & Humanities [7]	3,444	11,020	4,390	220.0	-60.2
Economics & Business [8]	6,364	7,430	25,580	16.8	244.3
Science	**5,636**	**9,750**	**10,500**	**73.0**	**7.7**
(%)	**24.7**	**25.2**	**18.7**		
Agriculture & Related Sciences	1,646	2,920	2,810	77.4	-3.8
Others [9]	3,990	5,030	7,690	26.1	52.9
Technical	**7,404**	**10,450**	**15,750**	**41.1**	**50.7**
(%)	**32.4**	**27.0**	**28.0**		
Engineering [10]	4,757	7,730	10,100	62.5	30.7
Architecture & Town Planning	993	1,260	1,840	26.9	46.0
Surveying	1,027	830	2,200	-19.2	165.1
Others [11]	627	630	1,610	0.5	155.6
Diploma Total	22,848	38,650	56,220	69.2	45.5

Source: Malaysia, Government of, (1991) **Sixth Malaysia Plan, 1991-95**. National Printing Department, Kuala Lumpur.
Malaysia, Government of, (1986) **Fifth Malaysia Malaysia Plan, 1986-90**. Government Printers, Kuala Lumpur.

Notes:
1 Include Islamic studies, language, literature and Malay culture, social sciences, library science and art and design.
2 Include accountancy, business management, resource economics and agri-business.
3 Include home science technology and human development
4 Include biology, chemistry, physics and mathematics.
5 Include pharmacy, applied sciences, environmental studies, food technology and science with education.
6 Include estate management, valuation, technology management and technology and education.
7 Include public administration, music, hotel and catering, tourism and secretarial studies.
8 Include accountancy, banking and business studies.
9 Include computer studies, applied sciences and mathematics.
10 Include building technology, automotive technology and electronic technology.
11 Include property, management and material technology.

Table 8
Selected Developing Countries: Education Profile and Human Capital Formation

	Enrolment Ratios, 1986-88 (%)			Adult Literacy Rate (% 15+)	Scientists and Technicians (per 1000 people) 1980-88	Tertiary Graduates (as % of corresponding age group) 1986-88	Science Graduates (as % of total graduates) 1986-88	Secondary Technical Enrolment (as % of secondary total) 1986-88	Tertiary Science Enrolment (as % of tertiary total) 1987-88	Third-level Student Abroad (as % of those at home) 1987
	Primary	Secondary	Tertiary							
High Human Development										
Hong Kong	-	74.0	-	88.0	200.4	6.7	-	10.0	43.0	32.2
Korea, Rep of	100.0	86.0	37.7	95.0	46.5	-	34.0	15.9	31.0	1.9
Singapore	100.0	69.0	-	86.0	23.8	5.8	31.0	-	29.0	25.3
Argentina	96.0	74.0	40.8	95.0	74.6	-	32.0	34.0	37.0	0.3
Mexico	99.0	53.0	15.2	85.0	-	2.5	38.0	12.6	36.0	0.6
Malaysia	98.0	57.0	6.7	74.0	-	1.4	31.0	1.7	34.0	38.1
Medium Human development										
Brazil	87.0	38.0	10.9	79.0	29.5	2.5	24.0	-	40.0	0.5
Colombia	83.0	56.0	13.9	85.0	-	2.6	26.0	20.8	36.0	1.3
Thailand	58.0	28.0	-	91.0	1.2	5.0	13.0	16.2	25.0	0.9
Fiji	100.0	56.0	-	80.0	13.0	1.1	63.0	9.1	35.0	53.6
Sri Lanka	100.0	71.0	4.0	87.0	-	1.4	50.0	-	37.0	5.6
China	100.0	44.0	1.7	68.0	6.6	0.5	43.0	7.9	18.0	3.2
Philippines	98.0	71.0	28.2	88.0	-	6.7	40.0	-	-	0.3
Nicaragua	76.0	43.0	8.4	80.0	-	0.9	38.0	18.8	43.0	9.9
Low Human development										
Indonesia	100.0	48.0	-	72.0	11.7	0.6	12.0	10.6	39.0	1.6
Pakistan	-	19.0	5.0	31.0	-	-	-	1.6	-	9.0
Morocco	55.0	36.0	9.8	42.0	-	1.1	26.0	1.4	59.0	13.9
Zimbabwe	95.0	51.0	3.7	62.0	-	0.5	8.0	1.7	32.0	8.3
India	66.0	41.0	6.4	44.0	3.0	-	-	-	32.0	0.5
Bangladesh	63.0	17.0	4.5	32.0	0.5	0.6	27.0	0.7	34.0	0.8

Source: UNDP (1991) Human Development Report 1991. Oxford University Press, New York. Tables 5, 14 and 15

per cent from the Fifth Plan period (Table 7). At the diploma level, similar trends are observed. Diploma-holders in Arts increased substantially over the same timeframe, while that from science and technical fields recorded declines.

From the above figures, it is in the vocational and technical fields that public educational institutions need to review their supply capacity as well as programmes. Moves have been made in this direction such as proposals for additional polytechnics and formal training centres. These have to be supplemented by private colleges and institutions. Indeed the biggest push needed is in correcting the supply gap in the technical and vocational category in the shortest time possible.

6. BEST PRACTICE PROJECTIONS OF THE SKILLED MANPOWER

The technical and vocational skill shortfalls can be more dramatically seen when Malaysia is compared with other newly industrialising countries in the region. Comparing across some selected developing countries in terms of education profile and human capital formation, Malaysia, although in the high-human development category, has a relatively low proportion of science and technical graduates (i.e. 31.0 per cent of total graduates) over the 1986-88, compared to 34.0 per cent for Korea, 50.0 per cent for Sri Lanka and a high 63 per cent for Fiji (Table 8).

At the secondary technical level, the Malaysian enrolment rate of 1.7 per cent of the total secondary enrolment is far behind her other counterparts in the high-human development category.

Table 9

Malaysia: Recurrent and Development Expenditure Allocations for Education Programmes, 1986-90

Type of Expenditure	Total ($'000)	Per cent
Recurrent (1988)		
Primary and Secondary Education	2,809.456	67.6
Higher Learning Programmes	685.740	16.5
Students Welfare Programmes	220.267	5.3
Teacher Training Programmes	195.332	4.7
General Administration	137.148	3.3
Technical and Vocational Education	87.276	2.1
Educational Planning, Research and Assessment	20.780	0.5
Total	4,156.000	100.0
Development (1986-90)		
Primary and Secondary Education	1,876.29	42.6
Technical and Vocational Education	935.63	21.3
Higher Learning Programmes	1,360.91	30.9
Teacher Training	229.00	5.2
Total	4,401.83	100.0

Source: Report of the National Economic Consultative Council (NECC), 1991. Tables 32 and 33.

In terms of government recurrent expenditure allocation for various types of education programmes, the proportion disbursed to technical and vocational education constituted only 2.1 per cent in 1988, a dismal amount compared to other expenses. Two interesting features may be highlighted from the percentage distribution in allocation. First is the imbalance in allocation for general administration and allocation for technical and vocational education. In terms of cost-efficiency, the allocation for general administration is much too high; while the need to improve technical and vocational training should be of top priority. Second, more than two-thirds ($2.8 billion of the total $4.2 billion) was allocated for primary and secondary education (Table 9). Similarly, the development expenditure allocation for technical and vocational education is lower (21.3 per cent) than that for primary and tertiary levels education.

These allocations have to be doubled if the targets are to be met. But the fiscal capacity of the government will be stretched, given the other development requirements. This is where the role of the private sector and industry become crucial in filling the skills gap.

7. CONCLUSION

Manpower forecasts at the macro- and sectoral levels have been used to highlight future occupational trends and likely imbalances in the labour market. These forecasts are sometimes used to provide directions for resources allocation and decision making on education and training priorities. Much of the criticisms on the generation and usage of manpower projections could have been averted if one bears in mind that forecasts of manpower demand only serve as the beginning of a planning process. No projections can be definitive, whether they are "best estimates" or a range of forecasts.

In addition, some occupations are more amendable to projection using the MRA than others. These include occupations where demand is demographically driven, such as teachers and health personnel. The more detailed the parameterisation, the more information can be determined by the projection model. The difficulty is to determine to what extent the norms adopted are realistically attainable given the resource constraints, since this will have a bearing on the "accuracy" of the projections.

Beyond the projection of these occupations, one is really moving into more difficult grounds. Ultimately, one has to contend with the difficulty of generating fairly accurate estimates on the types of skills that will emerge or decline in importance, especially in the dynamic industries. Changes in technology and production methods, and the substitutability of labour for capital cannot be adequately captured by the labour-output coefficient used in the methodology. Furthermore , the movement of labour and capital beyond national boundaries, which also have a bearing on the supply and demand of manpower, are extremely difficult to predict.

The shortfall in supply-demand of manpower in the country, particularly the skilled labour, is far larger than we think. More accurate numbers ought to be obtained to determine this, especially in the specific technical and vocational areas. We will not be able to predict the requirements accurately, but that does not mean that we should not do forward planning on the basis of the available data.

Even more drastic measures have to be undertaken, particularly by the private sector in meeting these needs. Collaboration with government programmes should be beneficial to all concerned. The expansion of private schools and colleges would also be necessary to support the government's effort, especially in view of fiscal constraints and other competing needs. And until the skills problem is rectified staff poaching will go on and companies will have a fear of investing in training only to have the workers leaving them for another job.

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QUESTIONS AND ANSWERS

Question: We've learnt a lot today about forecast planning, etc. I think it has been the thrust of OPP2, the thrust is on R&D, so I would like to find out from Datuk, how is R&D really being utilised in MIER, especially for the policy makers? Moreover, in view of the problems such as lack of methodology, data, and from your recommendations and concluding paragraph, how is information being fed to the policy makers' level and NECC; and how are these interpreted or developed into policies? That will be the direction that we badly need especially to overcome the manpower shortage. From morning till now, we have been stressing the point about shortage of skilled and semi-skilled manpower, and with all these problems and the kinds of research being done, how will we be able to achieve Vision 2020?

Answer: It is not so much what we have done and how that have affected the policy because what we have already done has affected policies. In other words, we have been involved in much of the jealousies both from the government track and the private sector track which in fact underlie many of the policies that are now on the table - NEP, OPP2, Sixth Malaysia Plan, IMP - MIER input has been directly and indirectly incorporated into those discussions. Some are in fact reflected in those policies but we don't want to claim too much but the more important implication of your question is the following - we now know what we are going to do. We know by way of policy the direction we are going to take and what we want to achieve by the year 2000 and 2020. By now if we do not know and if any of the segment of our Malaysian economy or society say they do not know, all we have to do is say go and read because it is already there. The issue is how do we implement those policies and achieve them, that in fact is the bigger task. Policy making is in fact simpler than actually implementing it. For example, if there's no data, ingenious data generators will create data. They can interpret as they have the methodology. We have all the skills, even in the University, ITM and we can do all kinds of things. We have done all that. In fact we are only now trying to see and make sure there are no inconsistencies in policies, making sure that our data bases are correct and that we are not creating incorrect projection and so on. But all that is already in place, the issue is how to implement it and that is where we are at; where the problems are, that is, we measure the quality of education and there is a lot of hue and cry from the private sector that the universities are not producing the people they want and they in fact have to provide value-added training in order to accommodate or feed the graduate from the former system into their own operation. Yet they themselves don't want to undertake that training because given the shortage that we all have, training becomes a private good, that is, if you train the private sector you incur cost. However, the result is of course, if you are a good corporate citizen, that is good, but they lose out or cannot capture that training, resulting from their own company operations. So therefore, with job-hopping now, our skilled and technical staff maybe over-pricing themselves and one day they have to feel the reckoning, can they produce what amount of money they have been paid, for example, in the stock broking centre. That is a whole industry and because of the growth of that industry, there is a great demand for dealers, reminsiers, etc. When you get into a kind of situation which we are now in, we have to begin to unload some of these. In fact when they build up their own research department they are paying top salaries to some ex-MIER staff who are very well-trained in that area. After a while they find that they are over-paying because of the demand and the job that they are going to produce, over extending themselves. Therefore, there is now a correction problem so I think it's not just a question of how you manage your HR, even at that micro level; very carefully, relative to demands and needs. So is implementation.

Question: In your projection there is a big gap between the demand and supply of needed skills. I wonder whether it is possible to have such a scenario where because of this gap in supply and demand, the local graduates have developed a sense of complacency, that is, they have an attitude problem where they become comfortable with mediocrity. Will this ultimately have an impact on our National Productivity and what measures can be taken to avoid such a problem?

Answer: I think we are back to the situation of the late 70s where universities are not yet producing enough Bumiputeras. Now whether we are producing Bumiputeras or non-Bumiputeras, they are absorbed by the ruling economy and we do get a situation in which people who are not qualified are put in different places. In the long run, we learn and improve in those places. The trouble is we can no longer afford to do this because of the constraints we are facing. The question now is the market which is turning very fast. We also have to correct the situation very fast. We no longer have the luxuries of the 70s where the government will absorb the people before they are given a test of market competency.