Chapter Five

Human Resource Development

Introduction

Like R&D, Human Resources Development (HRD) is also one of the main focuses of science policy. This is because HRD plays an important role in the socio-economic development of a nation. Results of a number of researches have shown that both aggregate productivity and economic growth increase along with the development of indigenous human resource development. Denison[246], for example, indicates that between 1929 and 1982, 73 percent of economic growth in the United States was due to human resource development, while physical capital and land improvement added 17 and zero percent respectively to long term economic growth.

In an emerging global economy, like Malaysia, HRD assumes greater importance. Economic competitiveness depends upon the quality of this factor. The importance of HRD for industrialisation was acknowledged in the United Nations Conference on Science and Technology for Development in Vienna.[247] In this conference, HRD was identified as a prime element of national policies for building indigenous economic capacity. In a study the United Nations

[246] E.F. Denison, *Trends in American Growth:1929-1983*, (Washington DC: The Brookings Institution,1985),
[247] UNDP, *Human Development Report*, (New York: Oxford University Press, 1990), p.5.

Development Programme asserts that human development is a process of enlarging people's choices. Among the most critical of these wide-ranging choices are the people's right to good and healthy life. to be educated and to have access to resources needed for a decent standard of living.[248]

The significance of HRD to S&T planning is reflected in the United States National Research Council report which notes that direct transfer of technologies takes place essentially by an adaptation process requiring the existence of the expertise - not only on the part of the donor but on the part of the recipient as well. Educational and Training activities in many fields are, therefore, fundamental to the process of transferring and adopting technologies.[249]

In addition, rapid technological change makes HRD a lot more important and imposes extra conditions on HRD. Technological change leads to requirement for manpower which is highly skilled and more adaptable. Whilst, social changes, including changes in the education system, alters the pattern of the supply of human resources in ways which are not always in gear with technological requirements.[250] These patterns, both in technological and social change, increases the requirement of a well co-ordinated planning between HRD and S&T development.

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[248] Ibid.

[249] United States, *Science and Technology for Development: A contribution to the 1979 UN Conference*, (Washington: Department of States, 1979), p.52. Furthermore, It is argued that; two basic requirements must be met if a nation is to create industrial technology that will foster the growth of the industrial sector: 1) a supply of trained practitioners of industrial technology, including scientists, engineers, managers, technicians and a skilled labour force, and; 2) a demand for their services.

[250] D.B.Hughes, "Aspects of Man-Power Planning" D.J. Bartholomew and B.R.Morris, eds., *Manpower Society*, (London: The English University press Ltd, 1971), P.1.

At the micro level, it is a well-known fact that technology is essential to a firm's international competitiveness and successful operation. They are however contingent to the availability of additional resources, especially manpower.[251] Given its importance to economic growth and social transformation, manpower planning has gone through different stages of changes and development both in terms of concepts as well as management approaches. This includes changes in terms of the concepts of policy formulation. This chapter starts with an epistemological discussion of HRD and its planning in the context of science policy, in Malaysia.

Definition

The concept of HRD embraces activities so diverse from mathematical work on stochastic models, the ergonometrics of job design, the sociology of management development, and to more prosaic but no less difficult problems of an industrial personnel department. It is in fact difficult to draw up a precise definition of HRD. It is possible that the search for a precise definition may be misguided.[252]

One of the central activities of HRD involved the design of behavioural changes in specified periods.[253] It involves an integrated approach to change work-related behaviour, using a range of learning techniques and strategies.[254] At

[251] Roslie L. Tung, *Key to Japan's Economic Strength: Human Power*, (Lexington Books, 1984), p.1.
[252] Ibid.
[253] Mirza Salyadan, *Human Resource Management*, (New Delhi:Tata McGraw-Hill Publishing Company Limited, 1995), p.233.
[254] David Megginson, Jennifer Joy-Matthews, and Paul Banfield, *Human Resource Development*, (London: Kogan Page Ltd, 1993), p.10. There are other definitions of HRD which emphasise one or another aspect of human activity. For example, Kammarudin Muhammad Jamal Esso Malaysia's director of Human Resources, defines HRD as 'people development'. People development according to him means 'maximising the potential of each employee and helping them to continually learn and better themselves so that they can be more useful in their association with the company, but with society to which it belongs'. *New Straits Times*, December 5, 1992.

the organisational level, This refers to the continuous effort by management to improve employee competency levels and organisational performance through training, education, and development programs.[255]

In short, HRD aims to establish a match between man and his job. It instils in man knowledge, skills, and attitudes that make him effective in his present job and prepare him for a future assignment.[256]

The following are related concepts that will be referred to in the discussion of HRD:

***Training*:** Training refers to activities that sought to improve individual's performance on a currently held job or one related to it.[257] It is an attempt to transfer knowledge or skill from one whom knows or can do to one whom does not know or cannot do.[258]

***Development*:** Development refers to learning oriented activities that involve both personal and organisational growth. However, development is not temporally restricted to a specific or future job.[259]

***Education*:** Education refers to learning of new skills, knowledge, and attitudes. It enables the employee to take a new job involving different tasks at some future

[255] R.Wayne Mondy & Robert M. Noe III, *Human Resource Management* , Fifth Edition, (London: Allyn & Bacon, 1993), p.272.
[256] Mirza S. Salyadan, p.218.
[257] Leonard Nadler and Garland D. Wiggs, *Managing Human Resources Development*, (San Francisco: Jossey-Bass Publishers, 1989), p.3.
[258] Rolf p. Lynton and Udai Pareek, *Training for Development*, 2nd eds., (New Delhi: Vestar Publications, 1990), p.xix. Training consists largely of well-organised opportunities for participants to acquire necessary understanding and skill. Ibid, p.8.
[259] Ibid.

time.[260] Education is also conventionally seen as a highly structured exposure to planned learning, the objective of which is to train the mind.[261]

Any discussion of HRD would be incomplete without the discussion of human being as a multi-dimensional entity. From this point of view human development is broad and encompasses all aspects of human life. HRD from this perspective is not limited to man's relation with the organisation or specific profession. The Malaysian present government has defined manpower as the one who "...is productive and disciplined, ...forward looking and equipped for their changing tasks, ...devoted to know-how and knowledge upgrading and self improvement,.... Skilful, talented, creative...have high standards with regard to their management abilities, language competencies, achievement motivation, attitude towards excellence and to their entrepreneurial spirit...."[262] This view of HRD is reflected in HRD planning in Malaysia, at least at the theoretical level.

The Origin of HRD

The concept of HRD management is of comparatively recent origin. Its origin is traced back to the aftermath of World War II. When many organisations experienced workforce shortages as a consequence of increased production needs

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[260] Ibid, p.273.

[261] Notably there are four elements in HRD; (I) all forms of training and education, (ii) the whole spectrum of the dissemination of knowledge and skill to learners of all ages, (iii) transfer of knowledge and the expansion of the learners mind, (iv) imparting of skills in all manner of operations from manipulation of tools to the use of information technology. Ungku A. Aziz, "Human Resources Development: The Key towards a Developed and Industrialised Society", Presented at the Conference on 'Towards A Developed and Industrialised Society: Understanding the Concepts, Implications and Challenges of Vision 2020' Genting Highlands, 5-7 December 1991, p.2.

[262] In the challenge No. 4 of the Vision 2020 statement, the spiritual enhancement of the population has been emphasised. The challenge that entirely involves values envisages the establishment of a fully moral and ethical society. The citizens in this society are strong in religious and spiritual values and are imbued with the highest ethical standards.

during the World War II period, as a result of the entry of millions of young men and women into the armed forces.[263]

The HRD management was reflected in the idea of 'post-war planning'. The latter signified a shift from the War period HRD planning which was concerned mainly with war production. The post-war planning HRD management took off when companies started producing entirely for civilian markets. This resulted from the fear that peace and the end of wartime shortages would change their environment drastically. Thus, corporate planning was added to the list of important managerial functions for many organisations.[264]

It is argued that even without this shift it is likely that formal corporate planning would have developed rapidly at this time. The consequence of industrial growth, technological change, and social trends would have necessitated this. Since with the growth of industry the demand for labour force would have correspondingly increased. Another cause for the rise of HRD planning was the increasing technical complexity of many products, and their faster obsolescence. Before a company would go ahead with a product requiring expensive research and development, it wanted some assurance through planning and forecasting. This was to ensure sales would be large enough and would continue over a long period to make the investment worthwhile.

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[263] Thmas H. Pattern JR, *Manpower Planning and the Development of Human Resources*, (New York: John Wiley and Son, Inc., 1971), p.34. Master planning or corporate planning was given impetus principally by World War II when organisations engaged in war work realised that the end of hostilities would mean they could no longer sell a large proportion of their output to the government and they would have to find new customers, if not new products, if they hoped to stay in business. An incipient need for manpower planning was also evident at this time.

[264] Ibid.

Furthermore, with the rise of the automation industry there was the corresponding need for long-term HRD planning. Automatically operated and other sophisticated equipment can never really replaced man's power because there are usually very expensive. High capital cost and maintenance may not justify production capacity and output demand. The success the new organisational structure may require new and different approaches and these are reflected in the developmental stages.

Paradigms to HRD

HRD has been approached in three ways: (i) the ad-hoc, (ii) the incremental, and (iii) the comprehensive approach.[265]

***The ad-hoc approach*:** Here the HRD plan is short-term and localised. It is often a reaction to specific problems faced by the industry or an agency. For example, as a response to acute shortage of system analysts' crash training program between one to three years is developed. This approach has very limited utility as it is reactive and where the trained labour has a long gestation period, the immediate requirements cannot be met. More often than not an agency limps along without the support staff.

***Incremental approach*:** This approach has some elements of the previous approach but it has a wider perspective of time and focus. It is utilised where labour demand is unclear and erratic. To be useful and effective this model requires a smoothing out process over a period of the HRD plan.

[265] Othman bin Yeop Abdullah, "Human Resource Development : The Key Towards A Developed and Industrialised Society", Presented at the National Seminar on 'Towards A Developed and Industrialised Society: Understanding the Concept, Implications, and Challenges of Vision 2020'. Genting Highlands, 5-7 December 1991. pp.6-8.

This approach requires clear identification of the skills required for specific jobs in specific industries for short and long-term perspectives. An internalised feedback and evaluation system is needed to improve and adjust the operational plan. There is also a need for continuous data update of technology and product change for the targeted industries.

***Comprehensive approach*:** HRD uses this approach to acquire information on global trends of industries. The information covers the rate of growth, the market structure, manpower demands and the various relevant technological innovations either current or in pipeline.

Furthermore, this approach integrates the manpower needs of all the players, namely the industry, the government and the training institutions. And mobilises the commitment and support of the critical constituencies. In this approach HRD goals are clear and various critical milestones are identified for purposes of evaluation. The plan draws some reference points from the priority or targeted industries in selected countries. This is used to stimulate and measure the HRD requirement and monitor the changes accordingly.[266]

Levels of HRD

HRD can be seen as having two levels, the *Micro* and the *Macro* levels[267]. At the first level, HRD develops the individual for his contribution to an organisation or the immediate society in which he belongs to. It maximises the potential of

[266] Othman contends that the most effective HRD plan is based on the comprehensive approach as its perspective is more extensive and global. It uses detailed indicators from model countries as reference points in developing and reviewing its own HRD plan. The involvement of various players with its implementation plan makes the HRD relevant and useful. Ibid, p.8.

[267] This model was synthesised by Y.B. Fuad bin Hassan in his paper "The Role of NGO in the Training and Human Resource Development", Presented at the Seminar on the 'Economic Challenges Towards 2000', 19-20 February, Kuala Lumpur, 1994.

employees and helps them to continually learn so that they can be more useful in their association not just with company, but with society to which they belong.[268]

Furthermore, at this level, HRD increases both skills and knowledge of the individual. He performs a specific job or tasks in accordance with the organisation's environment such as organisation's values, culture and workplace. This increases productivity, heightens morale, reduces costs, and accrues greater flexibility to adapt to changing external requirements. It also helps to meet the needs of individuals in their search for work assignment that can add up to life long careers.[269]

At the macro level, on the other hand, HRD involves formulating and planning HRD program for 'national level'. At this level, HRD achieves the objectives of growth and distribution. Here, also, the emphasis is on quality education and skill training including infusing strong moral and ethical values and positive attitudes more on the organisational scale then on the individual.[270]

Human Resource Development Planning in Malaysia

The HRD in Malaysia is planned in the context of the overall socio-economic planning as outlined in the National Development Plan (NDP). One of the targets of the Plan is the achievement of growth with equity and balanced

[268] It is important to note that at this level which is the organisational level, HRD includes both training and to increase skills and knowledge to help in performing specific job tasks in accordance with the total environment in the organisation such as the organisation's values, culture and workplace. Planning development programs will return values t the organisations in terms of increased productivity, heightened morale, reduced costs, and organisational stability and flexibility to adapt to changing external requirements; and also help meet the needs of individuals in their search for work assignments that ca add up to life-long careers. Flipo, Edwin B, *Personnel Management* , (Singapore: McGraw-Hill Book Co. 1984), p.3.

[269] Ibid.

[270] Ibid, p.4.

development.[271] HRD is of course one of the critical aspects of NDP since the latter calls for the creation of 'a productive and disciplined labour force with the necessary skills to meet the challenges in industrial development through a culture of merit and excellence without jeopardising the restructuring objectives.'[272]

The development of HRD in Malaysia, then, has to be explained in the context of socio-economic development policies of the country are planned through. These plans are for five years and it has started since independence in 1957. Each plan covers a period of 5 years. Currently Malaysia is in the last stage of the seventh five-year development plan (1996-2000).

HRD Strategies: 1966-2000

HRD in Malaysia is directed towards employment creation and expansion of the supply of skilled manpower. The broad features of HRD and employment strategies are incorporated in Malaysia's series of Five-Year Plans, briefly outlined below.

First Malaysia Plan 1966-1970

During this Plan period Malaysia was facing manpower shortages with a high level of urban unemployment and rural underemployment. The fundamental

[271] It is stated that 'The objective of National Development Policy (NDP), is to attain *balanced development* in order to create a more united and just society. NDP which emphasises *growth with equity* will enable all Malaysians to participate in the mainstream of economic activities, thereby ensuring political stability and national unity. *The Sixth Malaysia Plan: 1991-1995* , p.4.The concept of growth with equity has long played an important part in the country's development planning and, in 1971, was formally stated in the New Economic Policy (NEP), and also in subsequent development plans.

[272] The other aspects of balanced development includes, the balanced development; (I) between the goals of economic growth and equity; (ii) among the major sectors of the economy; (iii) between social and economic activities; (iv) in economic development between the states and between urban and rural areas in the country; (v) between material welfare and positive social and spiritual values; (vi) between economic development and protection of environment and ecology; and also a balanced approach in the (vii) in making S&T an integral component of socio-economic planning and development. *The Sixth Malaysia Plan: 1991-1995*, p.5.

objective of the First Plan was, then, to ensure that the nation's human resource were developed and employed in such a manner as to secure their greatest possible contribution to national economic development.

Therefore, HRD at this period focused on expanding education, promoting industrial development, finding production and investment targets, raising the agricultural activity and enlarging farm holdings. In addition, particular emphasis was given to clearing, planting and cultivation of new land areas, for the promotion of commercial crops.[273]

Second Malaysia Plan: 1971-1975

The Second Plan saw the implementation of New Economic Policy (NEP), which sought to eradicate poverty and reduce ethnic economic disparities. HRD was aimed at the creation of productive employment opportunities and their expansion of the supply of skilled labour.

Therefore, at this time, the focus was to promote rapid economic growth - seen as essential for employment generation. The private sector (particularly the industrial sector) was promoted through appropriate policies. Special emphasis was also placed on the growth of small-scale industries. In addition, new land was opened for settlements raise rural incomes as well as to create new jobs in agriculture.

Moreover, at this plan period the incentives were aimed to encourage new investments, particularly those that were labour intensive. Other measures

[273] *The First Malaysia Plan, 1966-1970* , ch.vi.

included were expanding industrial vocational training, orienting education towards S&T and strengthening of employment offices.[274]

Third Malaysia Plan: 1976-1980

During the Second Plan the rapid growth of skilled manpower and employment was essential for reducing unemployment, redressing poverty, raising incomes and promoting the absorption of the Bumiputra into the modern sectors. Therefore, in the Third Plan period the HRD strategies aimed at increasing the pace of economic activity, particularly through new investments.

This strategy increased the supply of trained manpower to meet the growing skill demands of the economy. Other new measures taken at this Plan period included the monitoring of the labour market, particularly through the Ministry of Labour. This was to ensure labour market policies and programs were achieving optimum utilisation of labour resources. It also increased the attention on labour laws and industrial relations to create a favourable climate for investment and growth.[275]

Fourth Malaysia Plan: 1981-1985

With employment creation progressing at a fast pace during the seventies, and unemployment falling to about 5 per cent in 1980, the thrust of employment policy shifted to management of human resources. This marked the continued expansion in the supply of trained and skilled personnel at the professional and technical levels. This shift consequently strengthened the labour market monitoring system. The latter was to improve the allocation of human resources,

[274] *The Second Malaysia Plan: 1971 -1975*,
[275] *The Third Malaysia Plan: 1976-1980*,

through detailed analysis of employment patterns and trends at sub-national levels.

In addition, employment strategy was directed towards strengthening the industrial base, particularly the manufacture of construction materials, industrial chemicals and chemical products, electrical and non-electrical products, and rubber products. The public sector was expanded further in order to strengthen the administrative machinery of Government, and facilitate its involvement in economic activities.[276]

Fifth Malaysia Plan: 1986-1990

The Fifth Plan was launched in the midst of recessionary conditions. A slower growth of the economy was expected to retard employment growth. In order to counter the growing unemployment, the Government instituted a series of short and medium term measures to create new opportunities. These include construction of new houses and construction of roads and highways. These were labour intensive, and were aimed to create jobs in rural and depressed areas.

Other measure towards creating jobs were conversion of ex-mining land for agriculture purposes, and making accessible to the private sector for the cultivation of viable export crops and agricultural. In addition, in order to generate self-employment, particularly in urban areas, local authorities were urged to be flexible in the implementation of rules and regulations pertaining to hawking. This was complemented with the setting up of more night markets and agriculture

[276] *The Fourth Malaysia Plan:1981-1985*,

markets. Moreover, steps were taken to boost aggregate demand through greater private investment. A process of liberalisation and deregulation was introduced.[277]

Sixth Malaysia Plan: 1991-1995

At the time of launching of the Sixth Plan, Malaysia's economy was in the midst of an economic boom. The consequent favourable employment situation had resulted in a tightening of the labour market. The focus of HRD was, therefore, towards enhancing labour productivity and increasing jobs with higher skill content. Other objectives of HRD were to improve the efficiency of labour markets and increase labour mobility in order to avoid skill mismatches localised shortages and other labour market rigidities.

In the areas of education and training, this Plan focused on improving, both, the quality and quantity of manpower. The private was to play a greater role in skill promotion as well as in strengthening linkages with public sector skill institutions. These were aided by improving the wages system to enable wage movements to relate productivity changes. In this period, the allowance was made for the use of foreign labour on a short-term basis in certain sectors of the economy where shortages are acute.[278]

Seventh Plan 1996-2000

In the Seventh Plan, the focus is on education and skill training. The goal is to produce an adequate number of skilled and quality workforce to meet the manpower requirements of the country as well as to produce citizens who are disciplined possess high moral values and good work ethics.

[277] *The Fifth Malaysia Plan: 1986-1990,*
[278] *The Sixth Malaysia Plan: 1991-1995,*

These require an increase in the capacity of existing institutions, and the establishing of new ones, particularly, in science, engineering and technical fields. Expecting a competitive learning environment, the HRD plan focuses on strengthening the delivery system through the provision of qualified and experienced teachers and instructors, as well as greater utilisation of modern technologies and computers to improve overall quality.

Given the massive changes brought by IT, the HRD planning in this period also aims to improve accessibility in order to increase participation at all levels through the expansion of physical facilities and the distance learning program. A further measure to improve quality of education and training in this period, will involve the management and implementation of education and training done through enhancing managerial capability as well as strengthening the monitoring and evaluation system.

The high quality requirements in the industry, demands measures to be taken in order to expand tertiary education facilities producing more professional manpower as well as improving the financial management and operation of tertiary institutions including through corporatisation and other means. An additional requirement is the need to strengthen (R&D) within the existing institutions of higher learning as well as collaborating with local and foreign R&D institutions. This includes the increasing science and technical manpower, particularly in R&D, and providing appropriate incentives to increase enrolment in the science stream.

The above overview of the evolution of Malaysian HRD planning gives us an idea of how important HRD has been to economic growth and to employment

creation. By and large, HRD has been influenced by the shifts in employment market affected by the changing economic circumstances.

The Malaysian labour market has fluctuated by several phases: From labour surplus in the late 1960s and early 1970s to labour tightness in the late 1970s. In spite of remedial efforts, Malaysian labour market continues to face shortages of skilled manpower. This was in the part owing to the inability of the supply institutions to keep up with the demands of the rapidly changing economy. One of the most important features of the latter period was the emphasis on the complementary and important role of the private sector in HRD.[279]

Vision 2020 HRD Strategy

As stated earlier, HRD planning is part of the over-all socio-economic development planning.[280] Embodied in Vision 2020 HRD strategy, the most vital ingredients required in achieving the objectives of Vision 2020 through HRD are providing adequate and relevant education and training to Malaysian.

Therefore, the government together with the private sector are gearing to provide adequate places with relevant and quality curriculum and facilities in tertiary education to meet the country's human resources demands. This will be accompanied with flexible and adaptive structures within training institutions to meet rapid changes and new demands.

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[279] EPU, *Human Resources Development Planning: Methods and Analysis*, (Kuala Lumpur: Economic Planning Unit), n.d., p.9.

[280] The overall objective of the socio-economic development in Malaysia is envisaged in the *Malaysia Forward*, pp.4-5. by the Prime Minister, which says that, ' Malaysia should not be developed only in the economic sense. It must be a nation that is fully developed a long all the dimensions: economically, spiritually, psychologically and culturally....'. And this can be seen also in the NDP objectives which looks for a balanced development with equity, *The Sixth Malaysia Plan*, p.4.

Moreover, to enable change and adjustments either in content or in direction of training and education, the industry is participating in studying global trends in technology and manpower. This is supplemented by the industry's participation in training at organisational and tertiary levels.[281]

According to analysts, the HRD strategy embodied in Vision 2020 is in line with the overall development planing. [282] It is a strategy based on the effective inculcation and strengthening of the basic core-values in the society as a whole. and the satisfactory development of an adequately and industrial needs and beyond. It is a two pronged strategy requires value strengthening and workforce development.

In the first prong, every and each individual in the country is required to undertake a self reappraisal of his her values against the set of values that have been determined, as a nation, to live by.[283] The second prong - workforce, involves identifying, forecasting and developing required skills to meet the nations needs. This would include industrial and commercial, R&D, as well as public sector needs.[284]

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[281] *Malaysia: The Way Forward* , p.8.

[282] C.D. Roxburgh, *Human Resource Development: The Key Towards A Developed And Industrialised Society* , Genting Highlands, 5-7 December 1991, p.2. This two-prong methodology is inspired by the 'Mengubah cara hidup'-the need to change the way of life in this country in the context of Vision 2020- by the Prime Minister.

[283] To achieve this objective, the author suggests that there is a need for a total national commitment as well as an all-embracing national plan for 'value strengthening'. For this purpose the population is divided into two target groups - adults and children. This division is based on the assumption of developing of values such as discipline, honesty, caring and a desire for learning in the formative years. The children are further divided into four groups – pre-school, primary pupils, secondary pupils and post secondary. The value strengthening should be different with each group. Ibid, pp.3-4.

[284] This would call for an accurate database, public-private sector co-operation, structured communication forums, joint projects, and so on. Ibid, pp.6-8.

Education and Training

In the Malaysian context, manpower is not only a major factor of production, but also seen as the major beneficiary of the effects of industrialisation and economic development. According to the Ministry of Labour and Manpower:

> "The provision of gainful employment has been regarded as one of the most powerful poverty eradication tools in development plans in Malaysia. The unemployed and underemployed are not likely to be poor but also ill equipped to participate in the economic life of the nation. The thrust of the national development efforts has been to create more employment opportunities, to upgrade skills and levels of income so as to improve the quality of life in Malaysia."[285]

Thus, the development of human resources through the education system is an important factor for economic development and a good investment of scarce resources, provided the pattern and quality of educational output is geared to the economy's manpower needs. This commitment to education is embodied in the National Philosophy of Education. Education in Malaysia is an ongoing effort towards developing the potential of individuals in a holistic and integrated The ultimate goal is to produce individuals capable of achieving a high level of personal well-being as well as able to contribute to the harmony and prosperity of the society and nation.[286]

The educational planning has concentrated on the development of such a holistic curriculum at all levels. As noted by the Sixth Malaysia Plan (1991-1995), a curriculum reform was started in 1989:

> "a significant change included in the integrated Secondary School Curriculum (KBSM) was the greater emphasis given to business-related and pre-vocational subjects. At the lower secondary level, a new subject

[285] Ministry of Labour and Manpower, *Labour and Manpower Report 1980*, (Kuala Lumpur: Ministry of Labour and Manpower, 1981), p.25.
[286] Ministry of Education, *National Philosophy of Education*, (Kuala Lumpur: MOE, 1986), p.2.

called 'Living Skills', incorporated business knowledge was introduced with the objective of exposing students to aspects of technology, commerce and enterpreneurship."[287]

This curriculum reform was to adjust the imbalance that exists in the institutions of learning. According to the Sixth Plan, despite the high rate of expansion in the output high- and middle-level S&T related manpower from institutions of higher learning, the imbalance in the type and number of manpower produced and required by the nation continued to be a problem.[288] A total of 13,605 personnel were involved in R&D activities in 1989, out of which 5,537 (41 per cent) were research scientists and the rest were supporting staff. A substantial number of the latter were engaged in agriculture-related research.[289]

Priority to High-Level Education

The education policy has given top priority to providing skilled manpower, much needed in the urban based employment sector which has was in the state of shortage of middle-level manpower, especially in the scientific and technical fields.[290]

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[287] *The Sixth Malaysia Plan 1991-95*, p.161. The Plan also intends to increase the intake into public skill training institutions through the completion of 8 new secondary vocational schools, the expansion of 29 existing vocational schools, and other public training institutions. p.177.

[288] Ibid, p.195.

[289] In the public sector a large proportion of R&D personnel in the public sector were in either basic or upstream research compared to applied or developmental research, as a consequence of which there was minimal impact on industry-related R&D. On the other hand, the number of R&D personnel in the private sector was too small to produce any significant impact on indigenous market-driven R&D. When comparisons were made with other countries in terms of the ratio of research scientists to the total population, the ratio of research scientists to the total population, the ratio for Malaysia (at 400 per million population) was indeed very low, while the equivalent ratio for Japan was 6,500 per million; United kingdom 3,200 per million; West Germany 3,000 per million; and South Korea 1,300 per million. p.197.

[290] *The Fourth Malaysia Plan 1981-1985*, p.92. It is important to note that the high-level manpower is engaged in the public sector rather than in industry. In 1980, approximately 76 per cent of professional and technical personnel were employed in government services, and it was then projected that the public sector would absorb 73 per cent of the increase during the 1980-85 period. *Labour and Manpower Report 1980*, 58.

During the Sixth Plan period, several efforts were emplaced to strengthen and upgrade knowledge and teaching skills in science and mathematics. An example of such effort was seen in the retraining of serving teachers involving the upgrading of skills at centres such as the Regional Centre for Science and Mathematics in Penang. Additional teaching colleges were established in remote areas, for example in 1954 a teacher training college was established in Bintulu, Sarawak, specifically to produce science and mathematics teachers for primary schools.[291]

In the Seventh Plan curriculum review the emphasis to the teaching of science and mathematics and technical related subjects is enhanced further. Perhaps one of the significant aspects of the review was the introduction of co-curriculum activities. Students will now have the opportunity to attend extra lessons in science and technical subjects such as computer education, mathematics and science.[292]

Tertiary Education

Tertiary education in the Sixth Plan period was directed at increasing enrolment in the degree, diploma and certificate levels, particularly in science, medicine, engineering and technical related courses. As a result, enrolment at the degree, diploma and certificate levels increased by 52,7 per cent from 100,590 in 1990 to 153,610 in 1995. Of the total enrolment in 1995, 58.3 per cent was in the degree courses, 35.5 per cent in the diploma and the rest in certificate courses. At

[291] *The Seventh Malaysia Plan 1996-2000*, p.311.
[292] Ibid,p.323.

the first-degree level, the total enrolment of the combined science and technical streams increased from 41 per cent in 1990 to 45 per cent in 1995.

Social Sciences and Technical Skills

With respect to the output from the public institutions of higher learning, arts graduate exceeded science and technical graduates. During the Sixth Plan period, 58 per cent of the first-degree graduates were in the art stream compared with 63 per cent in the Fifth Plan period. Improvements in the enrolment and output of science and technical courses reflected the successful measures taken to increase enrolment in these courses.[293]

Despite efforts in the development of high level and specialised skills, particularly scientific and technological manpower, disparities still continued to exist between the type and number of manpower produced and that required by the nation. In particular, the expansion in R&D manpower has not been able keep pace with the increasing demand for highly trained knowledge-based scientific, engineering and technical personnel.[294]

Manpower for R&D

In 1990 a R&D manpower survey undertaken by the Ministry of Science, Technology and the Environment revealed that out of a total of 22013 research personnel and supporting staff in public sector R&D institutions and universities,

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[293] Ibid, p.311.

[294] An analysis of the output of graduates from local public tertiary institutions for the period 1985-95, revealed the continued predominance of arts in comparison with science and technical graduates. Arts graduates during the Fifth and Sixth Plan periods made up the majority of graduates, that is, 53 per cent and 62 per cent, respectively. In comparison, science graduates accounted for 33 per cent and 25 per cent for the two Plan periods, respectively, indicating a decline in the share of total output, over the ten-year period. The output of technical graduates, on the other hand, remained at about 14 per cent for both periods. This means that by the end of the Sixth Plan period, local public institutions produced many more arts graduates compared with

6504 or 29,5 % were research scientists and the rest were supporting staff. Of this number of research scientists, some 1743 (27%) are Ph.D. holders, another 2665 (41%) possess Masters qualifications and the rest 2096 personnel or 32%) are first degree holders.[295]

Conclusion

Since independence HRD has evolved steadily in Malaysia. This is reflected in the HRD planning in through out the years, where the government has formulated strategies directed at training, education and therefore curbing unemployment in the country. However, problems remain when it comes to the manpower needs in the S&T field, in the technical and industrial fields. The major problems are the shortage of skilled labour and the mismatch between the existing skilled workers and the kind of skilled workers the industry really need.

One of these problems is the shortage of skilled labour, which is related to continuing skewed supply of the skilled labour. An example of the first problem, there is a critical shortage for Chargemen and to a lesser degree, fitters, electronic technicians, and mould & die workers. Workers are difficult to recruit as well as to retain. In addition, there is an urgent need for trained computerised machine operators, technicians and engineers.[296] Then there also exists some mismatch of types of training and the actual requirements. This is probably owing to the weak

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science and technical graduates, a trend that does not augur well for the establishment of a strong technological base. Ibid,p.429.

[295] MPKSN, *Annual Report 1990-1991*, p.13. An earlier survey undertaken by the Ministry in 1989 revealed that the public sector accounted for almost 87% of the total number of R&D personnel including supporting staff in the country, a substantial portion of whom were engaged in agriculture research. A large proportion of the R&D personnel in the public sector are specialised in basic and agriculture sciences compared with that in the applied engineering disciplines. This uneven representation in the public sector coupled with the small number of R&D personnel in the private sector has contributed to the consequent low impact of R%D on industry.

[296] This is taken from the reports of MEF, p.7, FMM,p.3., MEF, p.10.

linkages between the training sectors and industrial needs. The plan to encourage greater involvement of private sector in planning the vocational training programs may be able to address the problem.[297]

[297] FMM,p.5., and MEF,p.8.The problem of mismatching was raised in the Cabinet Committee on Training chaired by the chairman of the committee Dato Seri Anwar Ibrahim who was education Minister at that time. He stated that ' We have enough engineers, technicians and specialists but the specialised skills available are not what are needed in certain industries. 'The Star', April 20th, 1990.