**Abstract**

Advancement of scientific and technological development is a key strategic factor to build capability in technology. Strengthening technological capability has been seen as a crucial element in enhancing a country’s productivity and at the same time to stay competitive. Malaysia’s decision to embark on building its technological capability is related to the country’s ambition to become a fully developed and modern nation by the year 2020. To achieve this objective, Malaysia must have sufficient supply of human capital. Investment in skilled human capital is considered one of the most critical functions of long-run technological enhancement. This paper provides a discussion on human capital development setting in Malaysia. It will look at factors that have influenced the process of skills formation in the country and outline some suggestions for enhancing Malaysian talents development. It is hoped the suggestions offered would provide useful guidelines for developing and sustaining the supply of skilled human capital in achieving the aspirations of Vision 2020.

**Keywords**: human capital; science and technology; Malaysia

---

**1. Introduction**

The economic success of a country nowadays is measured by the investment made in its technological activity. Understanding the need to develop local technology in order to sustain national competency, Malaysia is shifting towards becoming a knowledge-based economy after the launch of the long term policy plan, Vision 2020, in 1991. Vision 2020 emphasizes building capability in technology with the aim of becoming a developed country by the year 2020. As a result of this action, scientific and technological based activity has developed rapidly. The cultivation of science and technology in economic growth implies an increase in knowledge and
technological learning in economic activities. The leading factor responsible for the success of this scientific and technological development is skilled human capital. It is estimated that Malaysia will need 500,000 skilled human capital by the year 2020 [1].

2. Contribution of science and technology to Malaysian economy growth

Developing a country with strong science and technology background requires heavy investment in research and development (R&D) activity. According to Lall [2], R&D enables Malaysia to assimilate and develop technological capability. It also allows the country to diversify its industrial base by identify critical technologies needed. For Rasiah [3] R&D is the core of productivity and is of fundamental importance for Malaysia in sustaining its economic growth. The activity is important for long-term economic returns and is necessary in sustaining technological growth.

Overall, R&D in Malaysia has shown positive progress since it was announced during the Fifth Malaysia Plan (1986-1990). Between 1986 and 1990, after it was first stressed, R&D contributed an average of 0.8 percent to the country’s gross national product (GNP). For this period, the contribution of the public sector in R&D expenditure was more than 80 percent, whilst the private sector input was very low. During the period 1991 to 1995, R&D contributed about RM541.9 million or 0.2 percent to the gross domestic product (GDP), with 55 percent contributed by the public sector and the balance by the private sector. The situation, however, has shown some improvement after 1996. Between 1996 and 2000, the expenditure for R&D increased to RM1,671 million or 0.5 percent of GDP. Since then, the amount keeps increasing. In the Ninth Malaysia Plan (2006-2010), Malaysia’s expenditure on R&D was RM2,971 million, which was 0.6 percent of the GDP [4].

In terms of employment, in 1989, it was estimated that 13,605 researchers were involved in R&D activities or the equivalent of four researchers per 10,000 workers. However, the numbers slightly decreased for the period 1991-1995. During the period, there were only 8,300 researchers and 12,450 technicians in Malaysia. The lower output of science stream graduates was one factor that affected the number of workforce available for R&D activities. It was reported that during the same period science graduates were only 38 percent of overall graduates [5][6]. During the Seventh Malaysia Plan (1996-2000), the number of researchers increased to 23,262 after drastic efforts were taken by the government, such as doubling the allocation for education and training development and increasing the intake for vocational education. Five years later, about 27,500 researchers were involved in R&D activities, or the equivalent of 25 researchers per 10,000 workers [4].

3. Malaysian challenges in human capital development

The term human capital was first used by Theodore W. Schultz in 1961. Schultz defines human capital as human abilities in which knowledge and skills are embedded [7]. Becker [8] views human capital as organizational assets whose economic value is derived from skills, competence, knowledge and experience. For Lim, Furuoka, Kasim & Roslinah [9], human capital can be referred as a worker who is attached to organizations growth. The importance of the human factor in economic growth has been recognized since the period of Adam Smith (1776). Smith argued that economic growth depends not only on physical capital such as machines, factories and tools but also investment in human factor. Human capital for Smith is the most important element in determining a country’s ability to innovate.

As for Malaysia, inadequate skilled human capital supply will definitely prevent the building its technological capability. Malaysia has put high investment on programs that could enhance its human capital skills. Increase the intake of students at the tertiary education institutions, allocate huge funding for educational purposes and underline skills development programs are among the initiatives taken by the government to support human capital development. Nevertheless, despite the efforts taken, the shortage of supply of human capital still persists. Several weaknesses that have been identified as the cause of the low number and performance of Malaysian skilled human capital are listed below:
3.1. Science education

Science and technology are empirical subjects that require students to actively participate, explore and enquire. To learn science effectively, it is important to have a high level of cognitive skills. According to Rahimah [10], Lee [11] and Roselina [12], heavy reliance on past-year examination questions and examination-oriented education system lower the cognitive abilities of Malaysian students to understand the concepts of science.

3.2. Supply and demand of skilled workforce

According to Lai and Yap [13], Malaysian skilled human capital supply is not adequate to allow technological development to occur. A comparative study of Lai and Yap on Malaysia, Korea, Singapore and Taiwan showed that Malaysia has the lowest supply of skilled human capital. Although among these countries, the number of science and technology graduates in Malaysia has the most increase; it is still insufficient to meet the country’s demand.

3.3. Networking

Technological change is crucial for productivity growth and competitive performance. As Malaysia is moving from a production economy to an economy that is based on knowledge, it is important to have sufficient preparation to enter the changing phase. This transition is not an easy process. Strong interaction between the government, university and industry through systematic cooperation can develop a national capability for economic growth. The lack of interaction among actors in the innovation system is identified as one weakness of Malaysian technological development. For instance, a survey done by SRI International [14] has shown that many Malaysian firms are lacking in R&D performance capability. As they increasingly need to develop their own technologies, these firms are seeking institutions to perform contract R&D and they do not know how to reach the universities or public research institutions.

3.4. Brain drain

The problem of brain drain is a threat to the country’s scientific and technological development and a loss to the country’s economic growth. Thiruchelvam, Kamarul Zaman and Koh [15] define brain drain as a situation where skilled human capital is flowing out of the country’s economy. They added that low salary offered and lack of infrastructure that could promote skills development are some of the factors contributing to the mobilization of skilled workers in Malaysia. It has been estimated that more than 250,000 Malaysian scientists and engineers have migrated to other countries, especially to Singapore, the United Kingdom and United States [16]. To address this problem, Malaysian government under the Ninth Malaysia plan (2006-2010) has launched the Brain Gain Malaysia program. The Brain Gain program offers excellent research environment, good salary, healthcare benefit etc. However, the response received was not quite encouraging [15].

3.5. Public attitudes towards science and technology

To increase human capital in the R&D fields, full understanding of science and technology is necessary. Science and technology awareness is an important factor in nurturing science and technology literacy in society. Based on research undertaken by Malaysian Science and Technology Information Centre (MASTIC) [17], the level of public understanding of science and technology is stagnating even though the government has taken various steps to increase it.
4. Recommendation in enhancing human capital development

In order to make Vision 2020 a reality, the greatest challenge for Malaysia is to ensure the workforce is equipped with the required skills and keeps abreast with technological changes. This paper submits some recommendations towards addressing the shortage of skilled personnel in order to strengthen the country’s scientific and technological development.

4.1. Practical training

A major problem faced by local industries is to find employees who meet position requirements. Many industries are not satisfied with the abilities and performance of local science and engineering graduates. It is claimed that their knowledge is too theoretical and they do not keep pace with current trends. To solve this problem, it is essential to improve the course content of education programs by putting more focus on practical aspects. Students should be given the opportunity to experience real scientific experiments. For example, students should be given industrial training starting from the secondary level. This method has been used widely abroad. For instance, in Sweden, students in secondary school (vocational oriented programs) are required to spend 15 per cent of their time in workplaces and use the experience to conduct study projects related to their courses [18]. Early exposure to the working environment will prepare students for the real working life.

4.2. Strengthen continuous learning process

Lifelong learning is important in producing multi skilled human capital that is able to cope with continuous technological change. As knowledge is not static, it is important for workers to be given opportunities to continue learning throughout their lifetime. To encourage lifelong learning, learning institutions should offer programs in order to enhance skill mobility. With the rapid progress of firms restructuring and the diversification of manufacturing, the gap between the needs of technological knowledge and the abilities of human capital skills will widen. Therefore, greater opportunities for re-education should be made available to upgrade the quality and skills of the workforce. This exercise has been practiced in Japan. As mentioned by Lanciano-Morandat & Nohara [19]:

For each graduate, the initial period of work is used to become an engineer through on-the-job training. Not having any immediately useful skills, all these new recruits undergo the same type of occupational and organisational apprenticeship. It is a common process for all young engineers, although they tend to be dispatched to different functions according to the level of university training: those with masters degrees to R&D functions, those with bachelors degree to development and design functions, those having two-year university training to design and manufacturing functions and so on (p.9).

4.3. Creating science and technology awareness and interest among the public

Low level interest in science and technology could lead to a decrease in the human capital venturing into R&D activity. The most important step that should be taken is to promote a positive attitude towards science and technology. The public should be educated on the importance of science and technology to the country’s economic progress. Fully understanding the need of science and technology will make it easier for it to be accepted. To make the public more interested in science and technology, they should be given the opportunity to have close contact with the science and technology environment itself.
4.4. Creating innovative culture

Innovation is the key for survival in today’s competitive environment. Innovation does not occur by itself. It has to be generated and nourished. Creating a culture of innovation is a complex process as it involves values and principles of individuals. The norm behavior cannot simply be changed by changing the management system. Much has to be done, particularly by the government in creating a supportive environment for innovation process. This includes the development of effective networking between organizations, financial mechanism, award system, training policy and supporting communication policy.

4.5. Promoting effective interactions

Human capital development involves continuous efforts by both, the public and private sector. The government is responsible to establish an environment that can stimulate continuous technological efforts and to upgrade technological capabilities. Policy formulated will influence the investment in human capital, creativity and management of national scientific and technical activities. The university and private sector, meanwhile, are responsible for participating actively in government programs. Korea’s experience in coordinating government policies in industrial development is a good example for Malaysia. Such as claimed by Radwan & Pellegrini [20]: Korea’s most significant development attribute was its ability to develop its skill and innovation base according to the needs of industry. Government played a major role in effectively making a transition from being a regulator to being an architect of the economy, making strategic decisions on guiding the country toward strengthening different sectors at various times in the country’s development, and by taking a less direct interventionist approach (p.142).

In addition, to make the country technologically strong, it is not enough just to produce excellent graduates, but graduates who are also infused with the entrepreneurial spirit. With proper research facilities and a pool of expertise, universities are the ideal place to generate excellent human capital. The research activities in the university should not be within the university itself, it has to be open to the public. The results gained from research activities have to be disseminated in order to commercialize the research output. The industry, on the other hand, should be willing to take the risks and opportunities offered by R&D in order to propel the economy. Effective collaboration between government, university and industry will not only increase productivity but also could be the pull factor to retain and attract human capital in the country.

5. Conclusion

Today, a country can be developed quickly if the level of its technological usage and performance is high. Contrary, those who are least involved in technological activity would be left behind. As a developing country with the aim of becoming a modern nation, the success of Malaysia economy undoubtedly depends on its human capital [21]. Domestic talents are important in order to allow the process of building local technological capability. As stressed by Romer [22], through his endogenous theory of economic growth, human capital and knowledge is at the centre of technological development. Therefore, to succeed in technological change, these two important features have to be emphasized.

References


[16] New Straits Times. Skilled Malaysian won’t return home, 10 January 2003


