# Public-private collaboration in research and development in Malaysia

**Nor Hayati Othman**

**Malaysia is set to be a fully developed nation by 2020. The strategies formulated by its ministries to promote research and development (R&D) have shown results. A recent example is the recognizing of four of its universities as 'Research-intensified Universities'. Over the years, there has been an increase in public and private R&D. In comparison with the industrialized and technologically advanced countries, Malaysia spends a relatively small percentage of its Gross Domestic Product on R&D. R&D is minimal in private-public collaborations, and the achievement for 2008 falls short of its target for R&D.**

**Prof. Dr. Nor Hayati Othman**
*Dean, Clinical Science Research & Professor of Pathology*
*Chairman, Conjoint Board Pathology*
*Universiti Sains Malaysia, 16150, Kubang Kerian, Kelantan, Malaysia*
*Tel: +60 (9) 766 3117 (office), 766 3417, 765 8371*
*Fax: +60 (9) 765 6291*
*E-mails: hayati@kb.usm.my, nor_hayati_othman@yahoo.com*

## A brief introduction to Malaysia

Malaysia comprises two non-contiguous islands in South-East Asia and has a total area of 329,784 sq. km. Eleven of its 13 states are in West Peninsula and the other two are in Borneo Island. It also has three Federal territories[1]. About 49.1 per cent of its population of 26.5 million are females. As per the Gross Domestic Product (GDP) listing by the World Bank, in 2007,[2] Malaysia had an annual GDP of US$ 180,714 million (ranked 36th). It was ahead of its neighbours such as Singapore (ranked 43rd), the Philippines (ranked 44th) and Viet Nam (ranked 57th), but trailed Thailand (ranked 33rd) and Indonesia (ranked 20th). With its literacy level of approximately 90 per cent,[3] Malaysia is expected to join the ranks of developed nations by 2020.

## Strategic designs and master plans

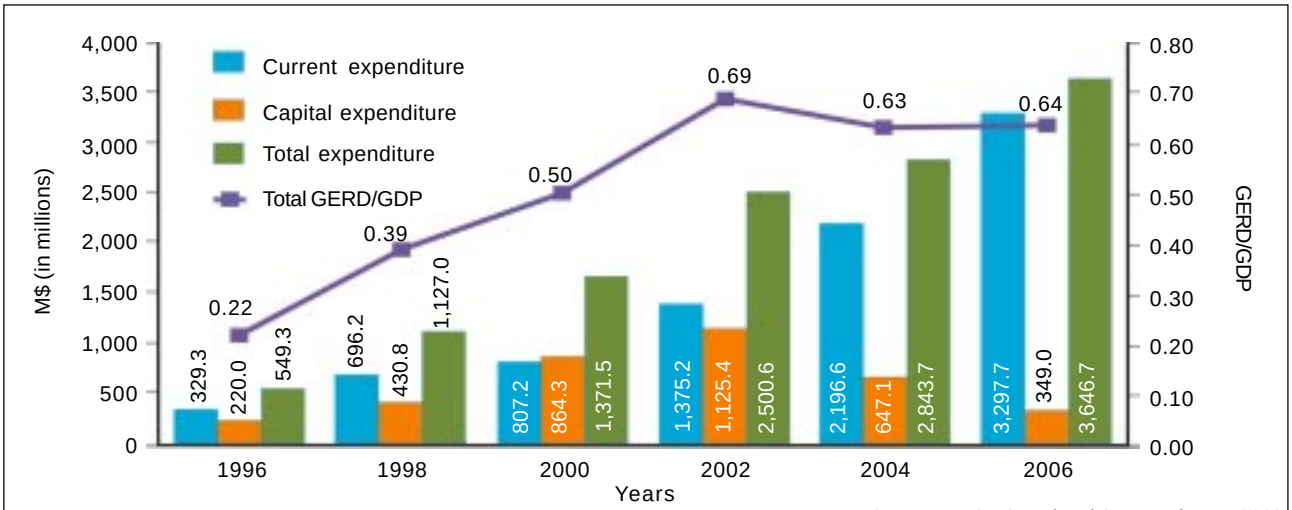
Since its independence in 1957, the country's administrative planning has taken the form of a master plan for

[1] Country profile: Malaysia. Welcome to United Nations, home page. www.un.org.

[2] See http://en.wikipedia.org/wiki/List_of_countries_by_GDP_(nominal).

[3] List of countries by literacy rate, United Nations Development Programme Report 2007/2008. http://hdr.undp.org/en/reports/global/hdr2007-2008.

**Figure 1: R&D by expenditure from 1996 to 2006**




*Source: MASTIC National Survey of R&D, 2008*

every five years. This comprehensive blueprint, prepared by the Economic Planning Unit of the Prime Minister's Department and the Ministry of Finance, has the Cabinet's approval to budget for the country's economic sectors. The 9th 5-year master plan (2006-2010) has budgeted for raising the country's capacity for knowledge creation, creativity and innovation (EPU, 2006). Substantial funds will be provided to the areas concerned with advanced manufacturing technology (robotics, intelligent software, smart sensors, high-tech packaging, automation and nano-processing), and advanced materials from petrochemical, automotive, biotechnology, electrical/electronic, and agricultural industries (EPU, 2006).

In 1996, Malaysia's gross expenditure on R&D (GERD) was M$549.2 million (US$162 million)[4]. Since then, it has been rising steadily to about M$2.84 billion (US$837.75 million) in 2004 and about M$3.64 billion (US$ 1.07 billion) in 2006 (Figure 1). The increase in R&D spending is evident not only in nominal terms, but also in real terms as indicated by the GERD per capita and the GERD/GDP ratio.

The mission statement of the Third Industrial Master Plan or IMP3 (MITI, 2006), announced by the Ministry of Trade and Industry, aims for innovation in and transformation of Malaysia's manufacturing and services sectors to enable them to compete globally. The blueprint also emphasizes the development and application of knowledge-intensive technologies, collaborations among government research institutes (GRIs) and institutions of higher learning (ILHs). It also aims to: create science and technology parks and industries; promote research-based industrial clusters for development; and scale-up its utilization of information and communication technologies (ICT) and other technologies along the value chain.

The Ministry of Higher Education (MOHE) has its own master plan for promoting education in the country. It aims to create new jobs and opportunities by enhancing the country's worth in the global value chain, through intellectual property rights and innovation. As of 2007, four of the 21 public universities have been accorded the status of research-intensified universities (RUs) based on their performance and expertise in R&D: the Universiti Sains Malaysia, the Universiti Malaya, the Universiti Kebangsaan Malaysia and the Universiti Putra Malaysia. An additional M$153 million (US$45 million) were allocated to the RUs for research, development and technology commercialization. Another initiative of MOHE is the Accelerated Programme for Excellence (APEX) for universities (MOHE, 2007).

The Second Science and Technology Policy, announced by the Ministry of Science Technology, aims for 60 researchers, scientists and engineers (RSE) for every 10,000 members in its labour force by 2010, as compared with 15 of these RSE professionals in 2000 (MOSTI).

By 2010, Malaysia aims to position itself as a technology provider in key strategic areas such as advanced materials, advanced manufacturing, biotechnology, microelectronics, ICT and nanotechnologies. By 2020, the Malaysian Higher Education Strategic Plan is aiming for 100 researchers/scientists/entrepreneurs per 10,000 members of its labour force (MASTIC, 2008).

## Current scenario: the pains and the gains

Similar to the experience of other countries, Malaysia is going through various stages of technological revolution: from agricultural to industrial, ICT, biotechnology and, currently, nanotechnology and space science. In 2008, the GDP of Malaysia was M$738,677 million (US$217,898 million) with a growth rate of 4.6 per cent.[5] However, unlike some of the more industrialized and technologically advanced countries, Malaysia

[4] All currency conversions at current rate (US$1 = M$3.39)

[5] Malaysia Department of Statistics. Gross Domestic Product / Gross National Income. See http://www.statistics.gov.my.

**Table 1: Key indicators of R&D activities in Malaysia (2004 & 2006)**

| Items/characteristics | 2004 | 2006 |
|---|---|---|
| GDP (million) | M$ 449,609 | M$ 572,555 |
| GERD (million) | M$ 2,843.8 | M$ 3,646.7 |
| GERD/GDP ratio (per cent) | 0.63 | 0.64 |
| Total headcount of R&D personnel | 30,983 | 24,588 |
| Total headcount of researchers | 19,021 | 23,092 |
| Total R&D expenditure in public universities (million) | – | M$ 360.8 |
| Total expenditure (million) | M$ 189.5 | M$ 296.9 |
| Total number of degree holders (PhDs, Masters, Bachelors) | 17,486 | 20,967 |
| Number of researchers per 10,000 labour force | 17.90 | 21.3 |
| R&D expenditure per R&D personnel | M$ 148,315.02 | M$ 91,782.60 |

*Source: MASTIC National Survey of R&D, 2008*

**Table 2: R&D activities in the private sector in Malaysia (2004 & 2006)**

| Items | 2004 | 2006 |
|---|---|---|
| R&D expenditure | | |
| Total expenditure (million) | M$ 3,096.4 | M$ 2,033.6 |
| Current expenditure (million) | M$ 2,860.3 | M$ 1,599.1 |
| Labour cost (million) | M$ 347.4 | M$ 578.5 |
| Operating cost (million) | M$ 2,512.9 | M$ 1,020.6 |
| Capital expenditure (million) | M$ 236.1 | M$ 434.5 |
| Human resources in R&D | | |
| Headcount of R&D personnel | 7,025 | 8,737 |
| Headcount of researchers | 4,160 | 5,940 |
| Headcount of technicians/support staff | 2,865 | 2,797 |
| FTE of R&D personnel | 5,627.79 | 6,127.20 |
| FTE of researchers | 3,529.27 | 4,104.30 |
| FTE per R&D personnel | 0.80 | 0.70 |
| FTE per researcher | 0.85 | 0.69 |

*Source: MASTIC National Survey of R&D, 2008*

spends a relatively small percentage of its GDP on R&D. For example, in 2000, Malaysia spent only 0.5 per cent compared with Germany (2.3 per cent), the United States (2.5 per cent) Japan (2.8 per cent) and the Republic of Korea (2.9 per cent) (Othman, 2004). Over the years, Malaysia's attitude towards research has become more favourable (Figure 1) and, as announced by the 2nd Science and Technology Policy in 2003, it has allocated 1.5 per cent of its GDP for R&D (Krishna, 2008). While there was a small increment on GERD from M$2,843.8 million (US$838.8 million) in 2004 to M$ 3,646.7 million (US$1,075.7 million) in 2006, there is only a marginal increase of GERD/GDP ratio from 0.63 to 0.64 per cent (MASTIC, 2008). Data indicates a small increment in R&D in 2006 compared with 2004 (Table 1).

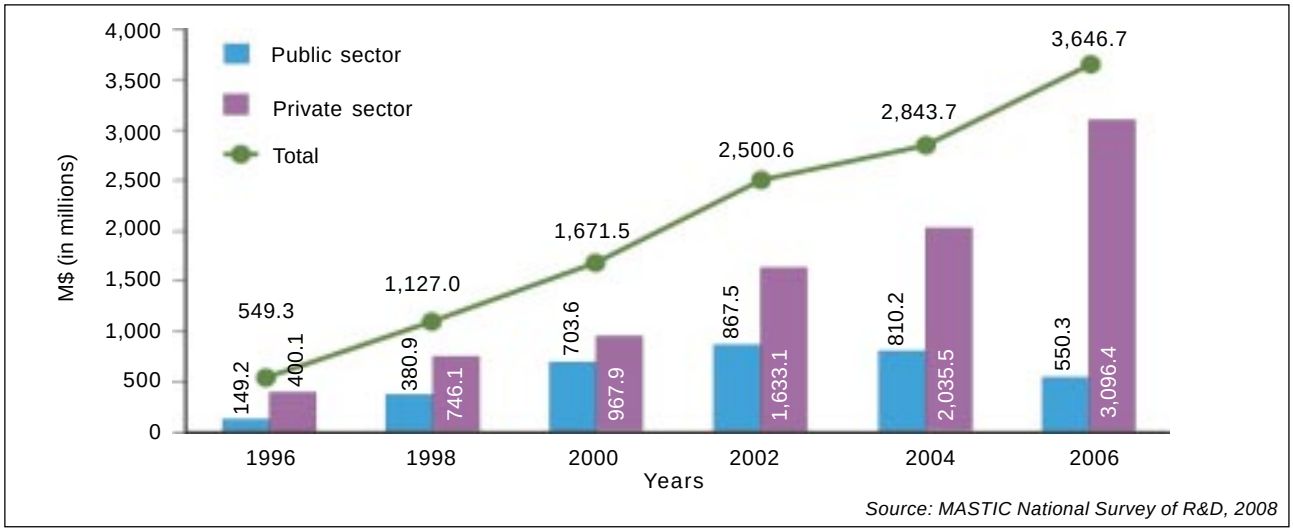
The private sector registered progressive increments in R&D activities (Table 2), while investments in the public sector R&D were much smaller (Figure 2). A few private research-based organizations – such as Petronas Research and Scientific Services (PRSS), Tenaga National Research and Development, and PROTON Research and Development – conduct R&D for the parent companies. PRSS offers research service in geoscience, petroleum engineering, facilities engineering, process technology, environmental management, petroleum products and laboratory services data management.[6] According to *Economic Review*, the performance of domestic-oriented manufacturing industries in Malaysia has been impressive. This statement is based on the following indicators: output trend, export trend, investment trend, employment trend and bank lending to the industries (Public Bank Bhd., 2001). Another evidence of the rising capital formation can be seen in the results of the Business Expectations Survey of Limited Companies by the Department of Statistics, Malaysia (Public Bank Bhd., 2007). The annual survey indicates that the capital expenditure by large private and public limited companies in Malaysia grew steadily from an average of M$17.0 billion (US$5.0 billion) per year in 2003-2004 to M$ 27.7 billion (US$8.2 billion) in 2005 (Public Bank Bhd., 2007). This growth has been attributed to R&D activities in various companies.

R&D activities have often been perceived to be the 'responsibility' of the public sector and undertaken by ILHs, GRIs and other research institutes, especially those associated with development of human resource. In the private sector, in 2006, R&D was most prominent in applied sciences and technologies, engineering sciences and material sciences (in the descending order) while ICT was in the top three in 2004 (MASTIC, 2008).

There were 17.9 researchers for every 10,000 members of Malaysia's labour force in 2006. This figure falls short of the targeted 50 researchers for every 10,000 members of its labour force as per the 9th Malaysia Plan (MASTIC, 2008), and places Malaysia along side countries such as South Africa (20.7) and Chile (19.3) (MASTIC, 2008). Among the other Asean countries, Singapore registers the highest

[6] See http://www.prss.com.my

**Figure 2: Public-private participation in R&D in Malaysia (1996 to 2006)**



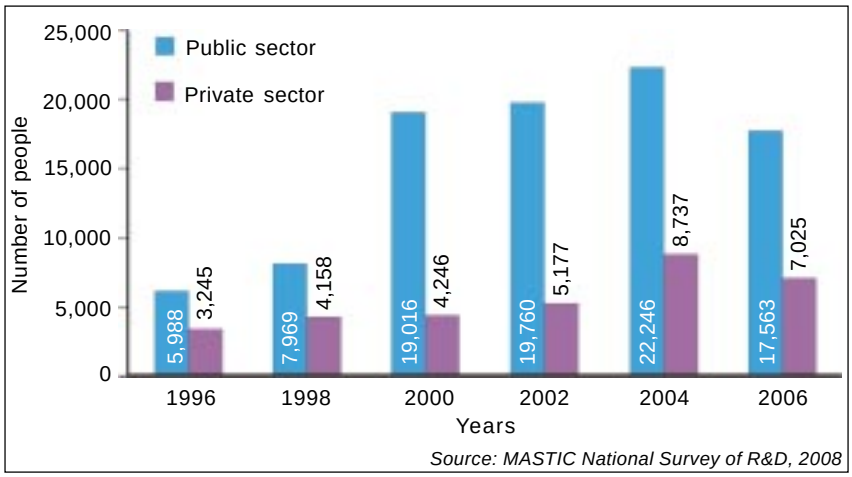

*Source: MASTIC National Survey of R&D, 2008*

**Table 3: Number of researchers in developed countries (2009)**

| Rank | Country | No./10,000 people |
|---|---|---|
| 1 | Finland | 99 |
| 2 | Japan | 97 |
| 3 | Sweden | 91 |
| 4 | United States | 81 |
| 5 | Norway | 78 |
| 6 | Australia | 67 |
| 7 | Denmark | 61 |
| 7 | France | 61 |
| 9 | Germany | 60 |
| 10 | Canada | 58 |
| 11 | United Kingdom | 55 |

*Source: www.nationmaster.com*

**Figure 3: Number of R&D personnel in in the public and private sectors (1996-2006)**




*Source: MASTIC National Survey of R&D, 2008*

concentration of researchers at 87.4, Thailand has 12.7, Indonesia 10.7 and the Philippines 2.4 per 10,000 members of labour force (MASTIC, 2008). Finland has the highest concentration of researchers, at 99 researchers per 10,000 labour force, while industrialized countries have more than 50 researchers per 100,000 labour force (Table 3).[7]

Researchers are present in more numbers in the public sector (Figure 3). Although the contribution of the private sector is small, the trend is gradually changing (MASTIC, 2008). A few public agencies have turned into government-linked companies (GLCs). GLCs, defined as companies that have a commercial objective and in which the government has a direct controlling stake, are significant players in R&D in the private sector. The Malaysian government has the authority to appoint the Board of Directors, members and senior management in GLCs, and to make major decisions (e.g. contract awards, strategy, restructuring and financing, acquisitions and divestments, etc.) for GLCs either directly or through GLCs.[8] The government's role is not limited to its percentage of ownership. These GLCs are major R&D players in the private sector.

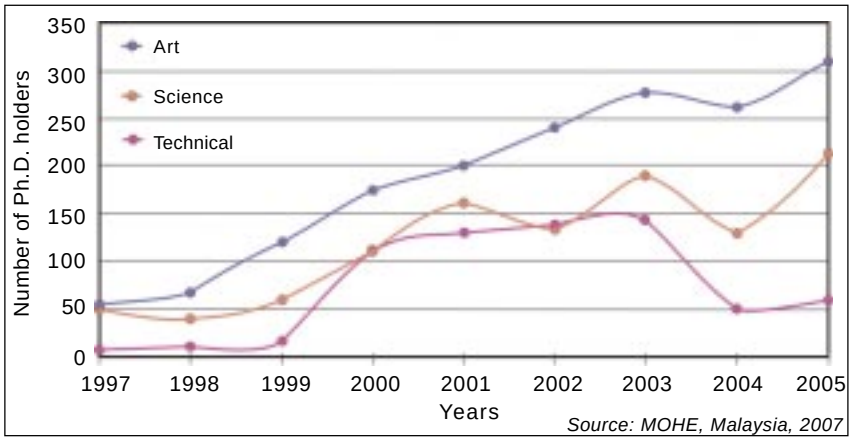
The country's Ph.D. holders are increasing through R&D activities (Figure 4). As the role of universities is to generate new knowledge, the focus should be on fundamental research (basic and experimental) rather than applied. Applied research should be the focus of research by the private sector.

Based on R&D expenditure, more of applied research was than experimental research conducted from 1996 to 2006 (Figure 5). Although each university adopts a different approach in implementing R&D strategies the emphasis is generally on human capital development (number of undergraduates and post-graduate students) and generating new knowledge. In the past decade or so, public universities

[7] See http://www.nationmaster.com/graph/lab_res_in_lab_for-labor-researchers-in-force

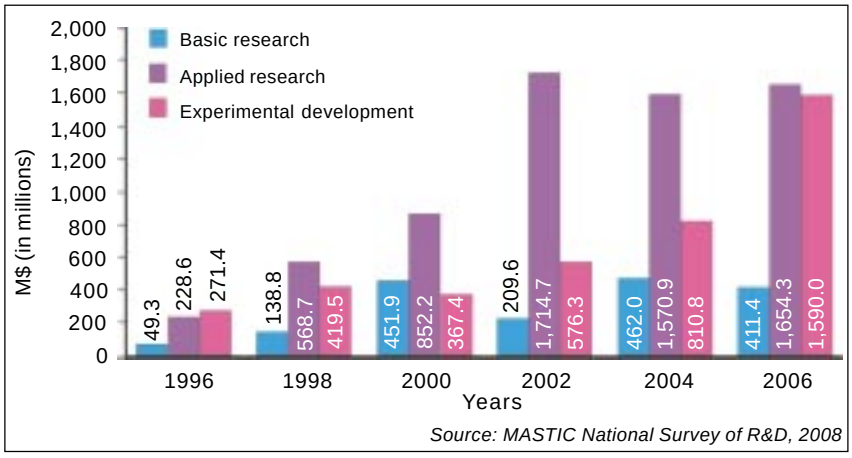
[8] What are government-linked companies (GLCs)? in http://www.khazanah.com.my

**Figure 4: Number of Ph.D. holders from public universities according to fields of study (1997 to 2005)**




*Source: MOHE, Malaysia, 2007*

**Figure 5: Proportion of R&D expenditure by type of research in Malaysia**




*Source: MASTIC National Survey of R&D, 2008*

as well as the four research universities are also into product-based research. Of the four research universities, University Sains Malaysia was awarded APEX status on 4 March 2009. It has also been promised increased financial aid by MOHE for R&D and other academic activities under the 9th and 10th Malaysia Master Plans.[9]

Besides the public universities, GRIs too carry out substantial amount of research. While all the public universities are under the administration of MOHE, the GRIs are under different ministries such as the Ministry of Science Technology and Innovation, the Ministry of Agriculture, and the Ministry of Defence.

[9] See "RM830mil to help USM reach Apex status" in The Star Online, 4 March 2009. http://thestar.com.my/metro/story.asp?file=/2009/3/4/north/3356437&sec=North

## Future directions: a few suggestions

Malaysia is on the path to becoming a developed nation by 2020. Various ministries in Malaysia have separate strategies to enhance their respective R&D. The establishment of research universities is an example of a progressive strategy. The private sector, which provides grants to basic and applied researchers in the public sector, should increase its involvement. Likewise, researchers from the public sector need to work hand in hand with researchers from the private sector.

Another possible strategy is to reduce the spread of research and instead, focus on in-depth research on certain specified fields by certain specified research institutions. At present, there is significant overlapping of research undertaken by most of the public sector institutions, including universities. The 'publish or perish' motto among academicians could be toned down so that they would enjoy conducting research, rather than being forced into it. The remuneration and career advance of researchers in a GRI could be made attractive. Some win-win strategies can be devised to enhance the interaction between researchers of GRIs and universities. A public-private university, purely to produce graduates with innovative and entrepreneurial skills, could also be developed.

Herbal research is gaining momentum; but, to date, very few of its products have reached the international market. Venture capitalists could help public sector researchers in this area. The main lesson that Malaysia can derive from the developed nations is to increase its GDP expenditure on R&D activities.

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