IEM POSITION STATEMENT (2004/01)
Approved by IEM Council on 21 Mar 2005

R& D AND INNOVATION

Note: This IEM Position Statement is approved by the IEM Council and it expresses the views of the IEM on 21 Mar 2005. The purpose of this statement is to provide objective, authoritative background information to persons interested in issues within IEM's expertise, particularly in areas where such information will be helpful in drafting sound public policies.

EXECUTIVE SUMMARY

This is an issue of great significance and relevance to the nation in its charted mission of achieving the advanced status by 2020 under the present competitive economic environment. Capability and capacity in engineering and technology related R&D is vital for a country to compete in the world market. It is also related to wealth creation that is very much the vision of IEM in its contribution to Malaysia's economic development. In all the more advanced countries the issue of R&D and Innovation is an important one and in the same spirit the Ministry of Science, Technology and Innovation has been vigorously promoting and supporting it.

IEM as a learned society and being impartial is well placed to contribute to the discussion on the issue of engineering R&D and Innovation in Malaysia. Fellow engineers as well as relevant parties both in the government and the private sector would be able to understand IEM's position, thereby be made aware of issues concerned and thus be able to contribute accordingly towards an effective and successful R&D and Innovation endeavour in Malaysia.

This is the first time IEM has come up with a Position Statement on this issue. IEM would continue from time to time to update this Position Statement so that its views and recommendations would remain current and relevant.

THE POSITION STATEMENT COMMITTEE:

The IEM established a task force on 23 January 2002 to deliberate on the issues and prepare a position paper on R&D. The Committee was chaired by Ir. Dr. Muhd Fuad Abdullah, an IEM Council Member. He is affiliated with Five-H and Associates. Membership comprised representatives from government research institutions, universities and industry as in Table 1.

Table 1: Members of IEM Task Force on R&D

Dr. Fatimah Mohd Amin	**Committee Member**	**MINT**
Ir. Dr. Barkawi Sahari	**Committee Member**	**UPM**
Dr. Mohd Hariffin Bin Boosroh	**Committee Member**	**UNITEN**
Prof. Dr. Jaafar Sahari	**Committee Member**	**UKM**
Assoc. Prof. Dr. Hajjah Khafilah bte Din	**Committee Member**	**UiTM**
Dr. Lee Sze Wei	**Committee Member**	**MMU**
Ir. Prof. Madya Dr. Eric K H Goh	**Committee Member**	**USM**
Dr. Mohd Dahlan Jantan	**Committee Member**	**FRIM**
Dr. Ibni Hajar Bin Rukunuddin	**Committee Member**	**MARDI**
Assoc. Prof. Dr. Hajjah Adilah bte Abdul Hamid	**Committee Member**	**UNITEM**
Ir. Dr. Ma Ah Ngan	**Committee Member**	**MPOB**
Ir. Nor Hisham Bin Mohd Ghazali	**Committee Member**	**IPHK**
Ir. Assoc. Prof. Muhd Fadhil Nuruddin	**Committee Member**	**UiTM**

Comments and views were also received from Dr. Ang Chu Suan, Managing Director of MMM Technology Sdn Bhd and Dr. Lim Chit Chow, Managing Director of Industronics Berhad.

THE ISSUE

The concern is that the level of intensity of R&D in the country is very low (refer Figure 1 and 2). Despite the provision of financial and fiscal incentives, the level of R&D intensity as measured by the Gross Expenditure on R&D (GERD) as a percentage of the Gross Domestic Product (GDP) is low compared to the levels in the newly industrializing economies (NIEs) and the developed countries.

This is due to the following:

- Low capacity in engineering sciences
- Low number of researchers in the engineering field due to unattractive remunerations for R&D personnel (refer Figure 3)
- Low demand for R&D by the industry

- Low rate of commercialization of R&D from the public sector institutions
- Existence of many barriers that hamper public-private sector collaborations
- Lack of the state-of-the-art facilities to attract industry participation in their R&D and other innovative activities

BACKGROUND

Malaysia aspires to become a developed country by the year 2020. For this aspiration to be realized, Malaysia needs to move quickly towards a knowledge economy. In a knowledge or K economy, knowledge, creativity and innovation are the driving forces behind sustainable growth and wealth creation.

Economists have shown that scientific and technological research is critical for economic growth. Knowledge intensive industries are driven not by machinery or skilled shopfloor workers, but rather by individuals engaged in research, design and development. In the K economy, intangible capital has become at least as important as tangible capital, and a greater share of value of tangible capital is based on intangible inputs.

Investment in R&D is crucial in a K-economy. R&D not only generates new knowledge but it also strengthens the capability to assess and exploit knowledge created elsewhere. A country that wishes to take advantage of the growing stock of knowledge needs to strengthen the knowledge base of its human resource, institutions and industries.

Both engineering research and science research are crucial in a world in which competition through technology has assumed a commanding role in the interactions between nations. Strong interaction between the two is important to ensure that knowledge from research is effectively utilized to generate technological innovations, which in turn leads to wealth creation.

Recognizing the important contribution of engineering research in Malaysia's transformation into a knowledge economy and economic development, the IEM established a task force on R&D and Innovation. The terms of reference of the Task Force are to examine the issues on R&D and innovation and to put forward recommendations to the government and all stakeholders on measures needed to enhance R&D and innovation in the engineering sector. Members of the Task Force are drawn from research institutions, universities and the industry.

The Task Force examined the issues on R&D and innovation from several aspects, namely: i) support and funding, ii) capacity building and competency, iii) reward and recognition, iv) facilities, v) commercialization, vi) industry demand, vii) public and private sector linkages, viii) effects of globalization, and (ix) technology forecasting, benchmarking and priority setting.

RECOMMENDATIONS

1. The IEM is of the view that increasing the overall R&D funding would increase R&D in the engineering sciences. **In this connection, the IEM recommends that the government increase its funding for R&D in public sector institutions.** At the same time, **the IEM would urge public sector institutions to enhance their efforts to bid for funding from the private sector and international organizations.**

   IEM could facilitate the linkage for Members to bid for private, governmental and international research funding jointly with public universities.

   IEM further **recommends that the strength of the R&D resources** of an institution or organisation must **be included as a criteria in granting R&D funding.** It is important to ensure that the engineering products and services generated by these R&D grants would be able to contribute to the national economy at many times the value of the funds granted. It is also **imperative** that **all R&D fundings be closely monitored to assess its return on the amount invested.**

   IEM could assist in managing of the Research Portfolio for MOSTI.

2. **The IEM** is of the view that the scheme to attract foreign scientists and engineers and Malaysian scientists and engineers abroad could be an effective short term measure in overcoming the shortage of R&D personnel and **recommends that this scheme be revived.** In redesigning this scheme, **the IEM recommends that the following approaches be considered:**

   a) **It should focus on areas that have been identified as priority R&D areas and where there are inadequate local expertise;**
   b) **Sufficient allocation should be provided to establish state-of-the-art facilities in the priority areas;**
   c) **Emphasis should be on attracting post-doctoral candidates; and**
   d) **The immigration procedures should be simplified as is the case with the recruitment of foreign knowledge workers for the Multimedia Super Corridor (MSC).**
   e) **In the process of recruiting foreign scientist, it is important that thorough screening be made by a local panel of experts to ensure that those foreign scientists are truly experts in their field.**

   While the recruitment of foreign scientists may help alleviate the shortage of R&D personnel, over the longer term, measures have to be instituted to address the shortage of supply of local graduates for R&D work. **The IEM** recognizes that the government's initiative to provide scholarships for post-graduate and post doctoral studies would address the supply problem to a certain extent and **strongly recommends that the government increase the funds for these scholarships.** At the same time, the IEM recognizes that there is a declining

interest in science and technology among the young, resulting in the relatively small numbers of students in the science stream at the secondary school level and subsequently the shortage of candidates for the science and engineering courses at the tertiary level. **The issue of appropriate reward and recognition for R&D personnel needs to be addressed to entice the young into choosing R&D as a career.**

In this area, IEM would be able to assist by:

i. ***Publishing the R&D success stories (successfully commercialised R&D) in the IEM monthly bulletin, the "Jurutera".***

ii. ***Publishing a book on R&D Achievements in the country - financial support from MOSTI may be required.***

3. The IEM recognizes that wages in the private sector is influenced by market forces. One way in which the government could influence remuneration of R&D engineers in the private sector is by introducing incentives that would enhance R&D activity in private enterprises. The IEM notes that the government has taken several initiatives to improve the remuneration of R&D personnel in the public sector. **The IEM urges the government to improve further the scheme of service for R&D personnel and benchmark its scheme with the schemes in other countries.**

It is also important that **schemes for recognition of contributions from R&D engineers be created and a congenial environment be provided for R&D.**

In this respect, IEM would like to offer our expertise to coordinate the scheme.

4. **The IEM is of the view that policies for public procurement should be reviewed with the aim of increasing the utilization of locally generated technologies.** Such policies would encourage local institutions and private enterprises to intensify their R&D and innovative activities.

It should also be **made mandatory** that **contracts are awarded to companies whose products and services are results of indigenous R&D.** The authority for procurement should assign a professional team to ascertain that the resources and local R&D works are genuine before awarding the contract taking into consideration the competitiveness of the price with imported products.

5. The IEM recommends that the **creation of spin-offs from universities and research institutions** be accorded due consideration as an effective means to commercialise public sector R&D. In this connection, the IEM recommends that **the government review the current scheme for R&D personnel in public sector institutions** to encourage R&D personnel to create companies for the purpose of commercializing their R&D results. In the interim, the IEM

recommends that **the government create a special fund to support spin-offs** from universities and research institutions.

It is also recommended that R&D funds or grants should predominantly be given to support R&D activities in areas that have potential commercial values. The success of R&D fund utilizations should be monitored and gauged from the commercialisation returns.

In this instance, IEM would be able to assist to:

i. Identify research needs of small companies and place the list in the website to solicit bids for industrial partners.
ii. Bridge university and industry.
iii. Provide guidelines for preparation of Specification of Bids.

6. The **Engineering Research Centre (ERC) Programme** implemented in the U.S.A. not only **promotes public-private linkage in engineering R&D but also facilitates the transfer of technology from public sector institutions to the target industry.** At the same time, **it produces graduate engineers who are better prepared for work in the industry.** Engineering Research Centres focus on the definition, fundamental understanding, development and validation of technologies needed to realize a well-defined class of engineered systems with the potential to spawn whole new industries or radically transform the product-lines, processing technologies or service delivery methodologies of current industries. ERC faculty, industry and student partners integrate discovery and learning in an interdisciplinary environment that reflects the complexities and realities of real-world technology. This environment adds an integrative dimension that is enabled by the critical size of ERCs. ERC innovations in research and education are expected to impact curricula at all levels from pre-college to life-long learning and to be disseminated to and beyond academic and industry partners. ERCs fulfill IRPAs strategic goals to increase the diversity of the scientific and engineering workforce by including all members of society regardless of race, ethnicity, or gender in all aspects of the centres activities. Because ERCs play critical roles in academe by integrating research, education, diversity, outreach and industrial collaboration, IEM views ERCs as change agents for academic engineering programmes and engineering community at large. The absence of compelling strategy for achieving demonstrable impact in anyone of these areas is sufficient reason to deny funding by IRPA.

This is a good model to adopt and the IEM therefore recommends that **the government consider the creation of ERCs or similar programme as a measure to ensure that public sector R&D matches the needs of the industry and to upgrade the R&D capability in engineering sciences.**

The IEM recognises that whilst promotional efforts can be made to encourage public to private sector linkages, such linkages cannot be forced. It is therefore recommended that **studies be made to improve the R&D environment in these sectors** such that both sectors seeks mutual cooperation for the betterment of each party's interest. One example would be the Silicon Valley model where high tech industries (having many complex technical problems to solve) are built around reputable technical universities (which can provide the brains and appropriate research facilities).

IEM could facilitate this private and public sector linkage.

7. The IEM notes that it is common practice among public sector institutions to claim that their laboratories are "national laboratories" or "centers of excellence. Since there is no single authority at present that is responsible for accrediting scientific and engineering laboratories, these claims are not verified. **The IEM recommends that the government appoint an authority that would be responsible for the accreditation of "national laboratories" and "centers of excellence."** Once a laboratory is accredited as a "national Laboratory" or "center of excellence", adequate funding should be provided to equip it with state-of-the-art facilities. **The IEM also recommends that researchers from both public and private sector be given access to the "national laboratories" and "centers of excellence."**

IEM could serve as the accreditor.

It is also noted that **public sector facilities** are often **purchased and installed on an ad hoc basis without careful coordination with other public institutions and without considering prioritisation based on National R&D needs**. In order to ensure that private companies do not engage the services of foreign laboratories or testing and certification institutions, **it is imperative that:**

i. these multi-million ringgit facilities are in good state of maintenance and calibrations.
ii. response time is shortened.
iii. the cost of the service is affordable.

8. While the identification of priority areas is an important step in ensuring that investment in public sector R&D leads to the desirable returns on investment, nevertheless the process in setting priorities needs further improvement and refinement. **The IEM recommends the authorities responsible for implementing the process for identifying priority areas for R&D and technology development review the approaches and methodologies for priority setting.** Consultation with industry should be enhanced in the priority setting process.

IEM could provide the feedback as representatives of the industry and offer technical assistance.

- ***IEM has 16 Technical Divisions specialising in various disciplines of engineering.***
- ***IEM has 15,000 members from various sectors of the industry.***

9. **The IEM recommends that the authorities responsible for approving foreign consultants review their approval mechanisms to ensure effective knowledge and technology transfer to local consultants and engineers.** At the same time, local engineering consultants should undertake R&D and innovative activities to enhance their capacities to absorb foreign technologies and to enhance their competitiveness in the global marketplace.

IEM also propose that in areas where **Malaysian R&D is matured, advanced or competitive against foreign entities, Malaysian companies should take the opportunity to expand and capture a bigger portion of the market share.** On the other hand, **in areas of weakness, active partnership with foreign consultants should be looked into to enable technology transfer.**

FIGURES AND TABLES AND DATA

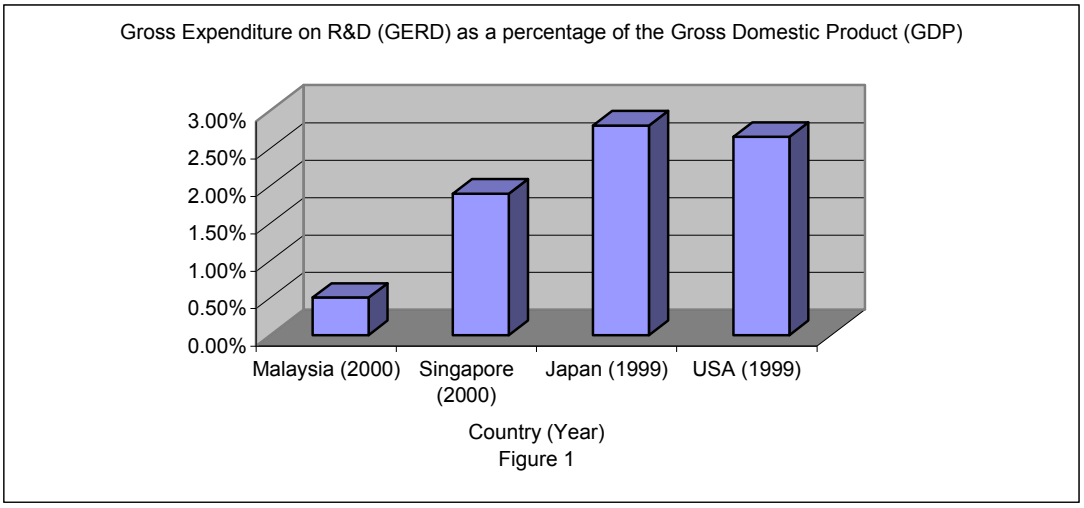


Figure 1

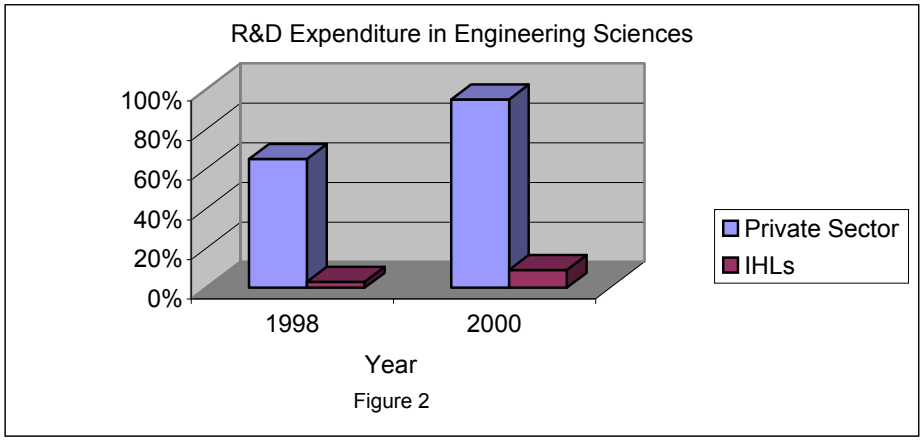
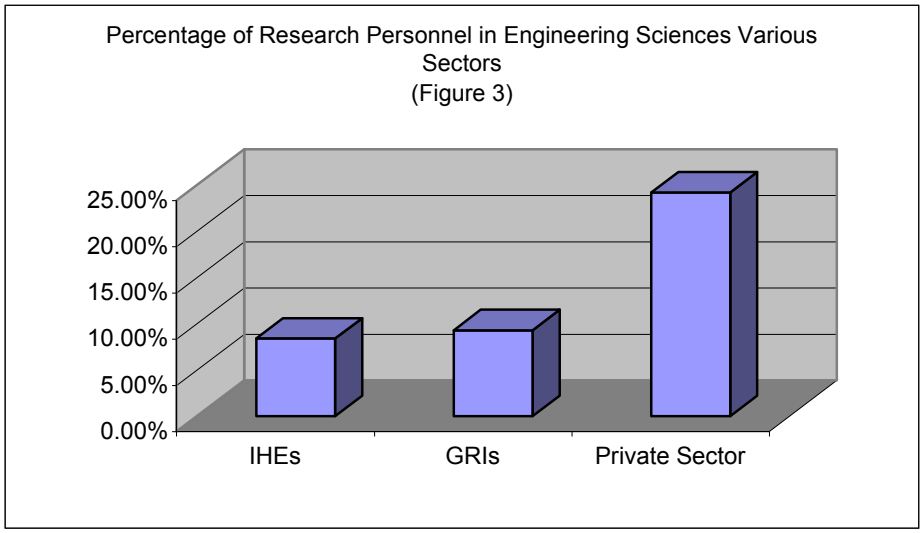


Figure 2


Percentage of Research Personnel in Engineering Sciences Various Sectors
(Figure 3)
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
IHEs
GRIs
Private Sector