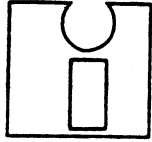


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COMMERCIALIZATION OF INVENTIONS AND TRANSFER OF TECHNOLOGY
IN THE ASEAN COUNTRIES
(EXAMPLE OF MALAYSIA)

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Building a High-Tech Innovative Culture in Malaysia

Much reliance has been placed on the manufacturing sector to achieve the economic targets of Malaysia. For this sector to play the role of the engine of growth, it must continue to diversify, seek product definition, be export-oriented and above all be competitive. There is only one way that the above can happen: through wider application of technology.

Currently, the technological capability of the manufacturing sector is almost entirely held by large multinational companies that have located their operations in Malaysia. However, there are also a limited number of local companies which have developed technologically through direct or indirect technology transfer from those multinationals.

Local SMIs represent the largest portion of the manufacturing sector. The Government has been very active in promoting the development of SMIs especially with regard to their technological development. Malaysia cannot rely on technology imports alone to drive its industrialization plan and indigenous technology development must be strategically pursued.

The commercialization of indigenous technologies has the potential to be a major contributor to the overall technological development of local SMIs. The Government has for a very long time funded a large number of R&D projects undertaken by local universities and research institutions. These research projects have resulted in a number of new, commercially viable, products and processes, and could be commercialized by local SMIs.

Commercialization of research

Currently, Malaysia has a total of 33 public sector R&D organizations which include statutory research institutions and 8 universities. Some of these organizations conduct a wide range of R&D activities while others are more focused on a particular sector. However, the R&D focus of these organizations are mainly in the agricultural and medical sectors. Both these sectors accounted for 56% of the entire Government R&D spending for the Sixth Malaysia Plan (1991-1995). Industrial research only accounted for 28% of the spending for the said period.

There is also a small number of privately funded R&D organizations, which generally conduct R&D for their parent companies. Examples of such organizations are Petronas Research and Scientific Services, Tenaga National Research and Development and PROTON Research and Development.

In the agricultural and medical sectors, public sector R&D organizations have long worked with local industries and have a some economic impact on those sectors through the commercialization of their research results and technologies. For example, the Rubber Research Institute of Malaysia (RRIM) has had a tremendous impact on the business operations of local rubber-based businesses. Breakthroughs in breeding new clones (varieties) of rubber, have benefited thousands of producers throughout the world. The Forest Research Institute of Malaysia (FRIM) has developed many techniques to add value to wood products such as particleboards, which were commercialized to at least 5 local companies.

Commercialization Process

There are many modes in the commercialization of technology. It could be in an informal way where companies approach individual researchers either to conduct R&D or to commercialize their findings. This was also quite prominent until recently, in respect of university-based research.

Presently, many local R&D institutions have formalized and promoted the commercialization of their technology through consultations services, collaborative and contract research projects. For the period of 1986-1995 a total of 664 contract or collaborative research agreements were conducted between private sector companies and local public sector R&D institutions.

In addition, the commercialization of research through direct technology transfer has become more focused especially in the high-technology area. This usually take the form of technology licensing. For the period 1986-1995, a total of 72 technology license agreements were signed between private sector companies and local R&D institutions.

Another new and more effective way of commercializing technology is through the formation of joint-ventures and creation of new businesses. To date, 11 companies have been formed as spin-off businesses of public sector R&D institutions. These companies are mostly financed by the Malaysian Technology Development Corporation while others are established by the Standard and Industrial Research Institute of Malaysia (SIRIM) and MARDITECH, the venture capital arm of the Malaysian Agriculture Research and Development Institute (MARDI). They are mostly in very high-technology areas such as in the production of vaccines, bio-diagnostic, laser equipment, specialized machinery and genetic improvement of livestock.

Background of Public Sector R&D

Until 1988, research in Malaysia was funded by various funds made available to researchers through university grants as well as research institution grants. These approaches were inefficient as there were a number of overlapping of research and a lack of focus. Efforts have been made to centralize and coordinate research funding that culminated in the establishment of the Intensification of Research in Priority Areas (IRPA) scheme which is coordinated by the National Council for Scientific Research and Development (MPKSN).

Essentially, the funding of IRPA is "bottom up." This means that researchers would propose their research projects to any of the five IRPA panels (Agriculture, Medical, Industry, Strategic and Social Science) which will decide on their proposals. In the Sixth Malaysia Plan, RM 588 million was spent on 2,329 R&D projects under the IRPA scheme where 48% were agriculture related.

The average allocation for research is actually relatively small to result in any kind of new products or processes. Many of the research results are product or process improvements. Out of the total number of R&D projects only 161 received an allocation above RM 1.0 million. However, these projects have resulted in significant number of

products and processes. This could be seen in the number of patents applied and pending for those technologies resulting from the research. Example of these are:

- (i) The laser technology and applications program undertaken by the Institut Pengajian Tinggi, Universiti Malaya, which received an allocation of RM 1.2 million has resulted in development of various types of lasers for different industrial applications. A patent has been granted for one of the laser devices.
- (ii) The research on the modification of natural rubber by Universiti Kebangsaan Malaysia, which received RM 1 million, has also resulted in a new thermoplastic blend, which is in the process of patenting.
- (iii) The multidisciplinary research on organotin chemical compounds conducted at Universiti Malaya, which has received an allocation of RM 1.2 million, has resulted in a number of formulations, which have been granted two patents.

Experiences in commercialization

Apart from maximizing return of R&D investments by the Government, public sector R&D institutions are also encouraged to create opportunities for collaborations which would foster stronger alliances with the private sector. As such, various measures have been taken to streamline their operations and to ensure a business-oriented approach. These measures include:

- (i) the establishment of a One-Stop Business Units at all public sector R&D institutions to handle business relationship with private sector companies and also to commercialize their respective research projects and results;
- (ii) providing greater flexibility and authority for these organizations to commercialize their research results; and
- (iii) corporatizing these organizations. The first three institutions which will be corporatized are SIRIM, Malaysian Institute for Microelectronics Systems (MIMOS) and Universiti Malaya.

To date, only 13 out of the 33 public sector R&D institutions have established One-Stop Business Units. Business units like the Consultancy and Development Bureau, Universiti Kebangsaan Malaysia, have been very active in promoting and selling services to the private sector. These business units have concentrated more on consultancy services since the return is faster and better than transferring technologies directly to the industry. Other business units include Consultancy Unit at Universiti Malaya, Innovation Centre at Universiti Sains Malaysia and Business and Advanced Technology Centre at Universiti Teknologi Malaysia.

Consultancy services are the main form of technology transfer conducted by these business units. However, there are many other mechanisms for the commercialization of research and technologies developed by local universities and research institutions. Other mechanisms for the commercialization of research are:

- (i) Outright sale of technology,
- (ii) Licensing of technology,
- (iii) Joint-venture,
- (iv) Start-up ventures.

The type of mechanism to be used in commercializing any particular research depends on various factors. Outright sales and licensing of technologies are only practical when they are able to attract the interest of companies which could commercialize them on a sufficiently large scale. Otherwise it would be very difficult to provide sufficient return on investments. For Malaysia, the larger companies have generally been sourcing for technology from overseas while the smaller companies do not have the resources (technical and capital), to efficiently absorb technologies.

Commercializing technology through outright sales and licensing would need more effort in promotion. Nevertheless, these forms of technology commercialization would have minimum involvement of the universities or research institutions, once the technology has been transferred to the company. From a company's point of view, there are many reasons why they consider licensing technologies as a form of commercialization, that is less attractive than other forms. The reasons are:

- (i) the status of the research results or technology is very important in outright sales or licensing of technology. If the technology is not completed, it would be more difficult. The completion of a research project depends greatly on factors like funding, scaling up, pilot plant and prototyping;
- (ii) whether the technology provides partial solution to industry needs or should there be technological inputs from other sources. Since there is little multi-discipline and inter-institution research conducted in Malaysia, technology to be commercialized usually are not very attractive to the industry;
- (iii) companies in Malaysia usually lack the technical expertise and personnel to successfully absorb technology into their current manufacturing process. If a technology is meant to replace existing products and/or processes of a company, the absorption of such technology is even more difficult, since many factors on the viability of the technology need to be studied;
- (iv) Malaysian private sector is quite new in the areas of high-technology industries. Most of the time, there is no established industry where the technology could be commercialized. Example of these areas are in medical diagnostics, genetic improvement of animal breeds or plant varieties, and laser applications.

The commercialization of technology through the creation of new businesses or joint ventures by means of provision of venture capital funding have become more prevalent. Joint

ventures and start-up ventures, although harder for local universities and research institutions, provide many advantages to them. The advantages of these mechanisms include:

- (i) providing local researchers with the exposure and insights to the needs and requirements of the industry;
- (ii) creating high-technology industries which are non-existence in Malaysia;
- (iii) enabling the universities or research institutions to get a share in the growth of the company when the project is successful, instead of merely getting the royalty payments; and
- (iv) providing the researchers with greater control on the commercialization process. If a technology is licensed to a big company, the technology would only be one of many projects undertaken, therefore, the attention given to the technology is of lower priority. If the technology is the sole initial activity of a joint venture or start-up company, it would enjoy higher priority and attention. Thus, the chances of success are even greater.

Establishment of MTDC

Malaysia Technology Development Corporation (MTDC) was established in 1992 as a Government-industry venture to become the national body for the commercialization of research projects and results of Malaysian universities and research institutions and promoting the growth of technology-based enterprises. It is a venture capital company under the jurisdiction of the Ministry of International Trade and Industry.

The activity of commercializing research results is undertaken by the technology transfer division of MTDC. Since its establishment, MTDC has gained a lot of experience in commercializing research results in Malaysia. MTDC has acted as coordinator to all the business units of local R&D institutions and has successfully commercialized 12 technologies developed by them through technology licensing to private sector companies. The number does not necessarily represent the total number of commercialization projects undertaken independently of MTDC and, therefore, cannot be taken as the measure of the success of commercialization in Malaysia.

At the same time, MTDC has established 6 start-up companies to commercialize research results through the provision of venture-capital financing to various joint ventures with researchers and universities. Commercialization of research projects and results has shown some promising results even if such activity is still in its infancy stage. However, there is still room for improvements and strengthening of the mechanisms of commercialization.

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