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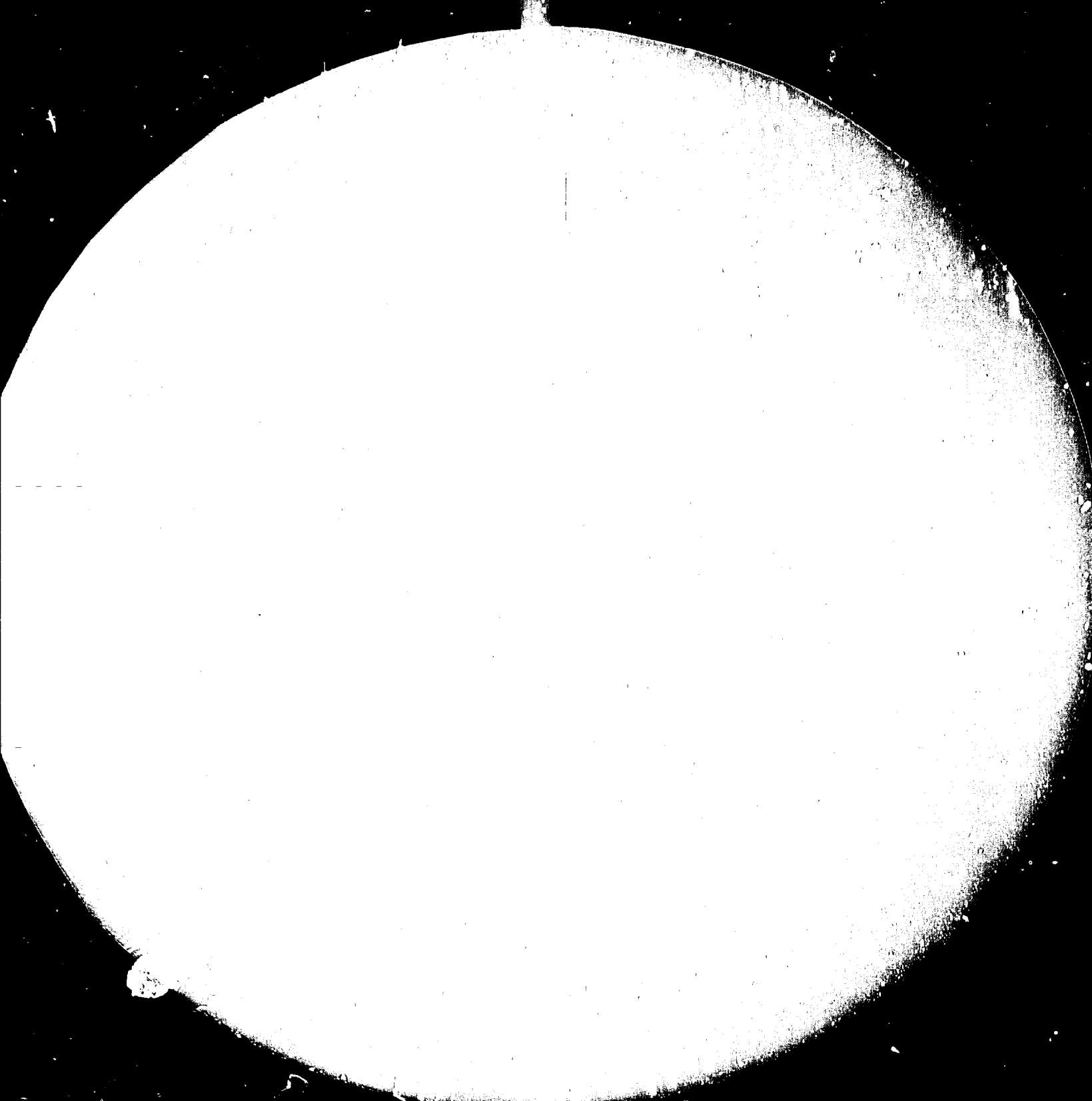

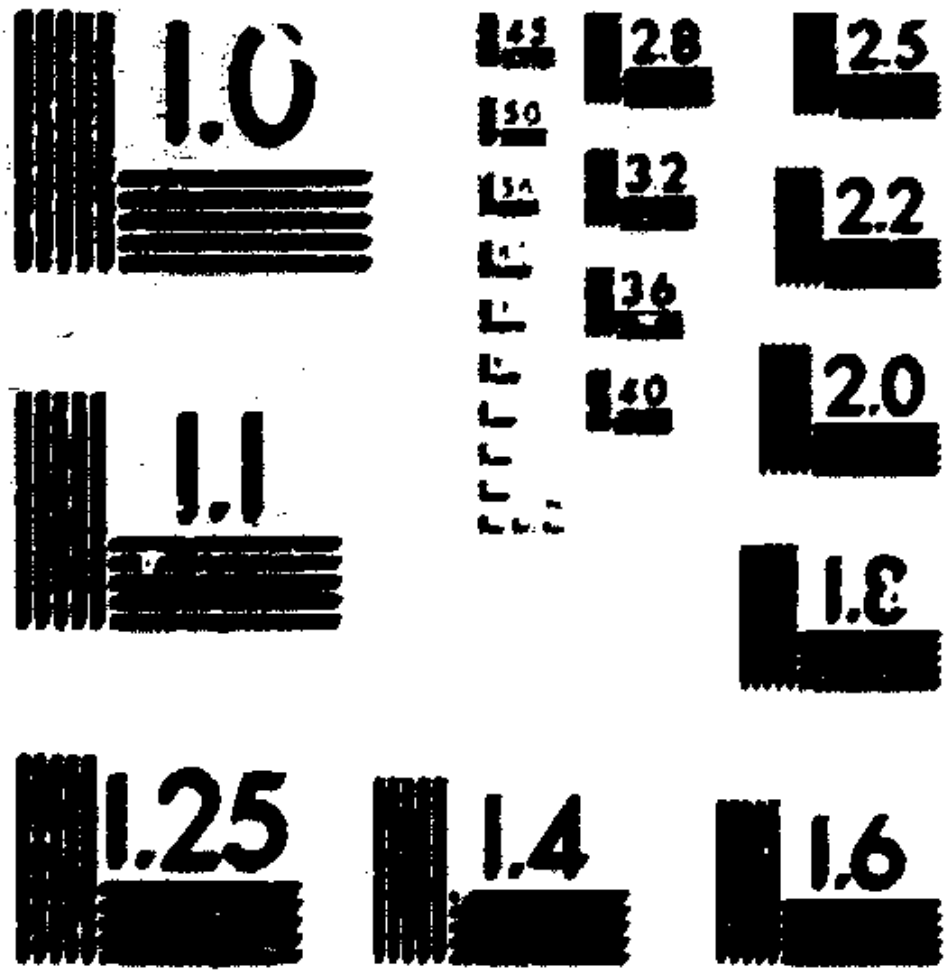

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COMMERCIALIZATION OF RESEARCH RESULTS: THAILAND EXPERIENCE*

by

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INTRODUCTION

The prospect of entering into modernization through industrialization is something that is always nurtured in any able mind in all developing nations. Research for the sake of learning and achievement has long been well accepted by scholar trying to achieve earthshaking or revolutunary result as the end product. However, putting research result that is saleable into practice is something which is entirely different. Research results will need to develop further with engineering design, resulting in machine that will repeatedly reproduce a large number of goods with sturdy, usable, nice materials and of course with saleable quality. Achievement of such, is the starting of the industrialization or we can say that such products have already been commercialized.

Developing countries have generally realized that the tools of the trade that is "technological resources" is lacking or almost absent in most cases. It has been proven beyond doubt that technology is essential to economic development and very indispensable to the modernization of the nations. Therefore, they have generated great demand for the transfer of advanced technology in the earliest and fastest way possible. In most cases, these countries do not have sufficient technological structure to absorb such technologies and thus do not achieve effective transfer as it should be. A technological unit which will both modify and improve as well as adapt imported technology is

missing. Industrial Research and Service Institutes (IRSI) usually have been established to fill up these gaps, usually with the assistance of Governments. Most developing country governments have invested substantial sums in IRSIs and there is a general demand for some return on the investment in term of economic and social gain. The fact remain nevertheless, that the commercialization of the R&D results of most government sponsored IRSIs in many of these developing countries is very limited in comparison with what is needed by industry. The successful management and operation of an industrial research and development institute in a developing country is not an easy proposition. Apart from being good in any particular fields of R&D according to the national priority, it needs to be realized that the ISSIs are set up primarily to help existing industries and catalyse new ones. But the other role which include development and commercialization of a modified or new product or process is not strongly recognized and promote as it should be. Some of the reasons for lack of commercialization have been identified e.g. absence of market analysis and techno-economic feasibility studies, unvillingness of industry extrepreneurs to take risk, lack of fund to operate, lack of good rapport with industries etc. Many of these problems will be point out under Thailand contition, with successful and unsuccessful case studies. The systematic use of all available capabilities and resources in an organized form is an indispensable factor in achieving success and culminating industrialization through effective ISSIs and industry linkage of any developing countries.

1. Problems facing Implementation of R&D Results

In Thailand, as in many struggling developing countries where development to achieve modernization of the nation is the top most important issue facing the country as a whole. Let alone the question of playing the underdog role in competing with developed nations to obtain and trying to process high and sophisticated technologies. It is therefore, appropriated to separately identify the question of R&D results and the question of implementation commercially of the feasible ones:-

R&D results:- Many of this R&D projects do not have enough impact sufficient to be process further to industry. In many instances, choice of the R&D projects which have good market potential had been overlooked. The government, however, allots a very low percentage of GDP for R&D activities i.e. only 0.018% of GDP while USA, Japan, England and Germany have given a much higher figures.

Table I Comparison of R&D expenditure per percentage of GDP

U.S.A.	2.8 % of GDP
Germany	2.5 "
Japan	2.2 "
England	2.0 "
Thailand	0.018 "

Imported R&D results are usually proven to be commercially viable and in Thailand large amount of the so called proven technology have been introduced into the country either by licensing, royalty, trademark, franchise or joint venture. These technologies have not been or do not pass through the proper transfering process where we can skillfully retained them. The normal trend indicates a gradual increase

in buying foreign technology.

Table 2 Depicts the increase of imported technology to Thailand

Year	Imported technology (Million dollars)
1978	24.1
1979	31.4
1980	40.7
1981	57.8
1982	62.7

It had been repeatedly mentioned that acquiring the know how knowledge through buying or imported technology is something that should be done, particularly when that technology is lacking. As a follow up feature, however, the country should have personnel and technological structure which will absorb and digest as well as readily transfer such technology. It is here where many developing countries as well as Thailand set up a multi-disciplinary institute particularly of IRSI's nature. This is to activate R&D and to play a leading role in absorbing the technology and initiating the nation's industrialization.

The Implementation Stage: New imported technology after the period of R&D as well as adapting or absorbing of the technology need two important steps to be completely commercialized. These two steps are:-

(E) Engineering design and prototype development and (I) Industry (production), It is often believe that a commercially viable R&D discovery will immediately yield a profit when implement, we know now that this is not always true. In fact, these two stages acquires a much higher investment, take more patience and effort than the actual R&D stages. The marketing demand and the quality control are the two added activities that are crucial for successful commercialization of the R&D results.

Some of the common problems which have been ov: looked in the implementation of the R&D results, particularly in the small and medium scale industries are as follows:-

1. Lack of financial source for the venture.
2. Lack of managerial skill in the process of setting up industry.
3. Having no or few specialist to oversee the process.
4. Lack of support & exemption of tax or some meaningful incentives from the Government.
5. Lack of business management or knowhow to operate new venture.
6. Lack of good rapport with related private enterprises.

2. Case studies

The experience in commercialization of the research results by TISTR has had some mix success. Most of products are mainly in agricultural products or agro-industry.

Garlic natula - a water soluble garlic extracts powder has been developed by TISTR directly from R&D, bench scale and pilot scale. At present a private company has set up factory and the production expects to come out into the market very soon. Many other medicinal plants products including essential oils are in various stages of research and development.

Nursery blocks. The process in developing good practical nursery block has strong impetus in Thailand reforestation program. TISTR had perfected the process, one private company had picked up the technology and put in production. However, the products did not stand up to the expectation and the standards quality control has been poor, finally,

the company had to stop operation.

Many other potentially research results at TISTR do have strong to very strong possibility, but the question of marketing and the quality control loom up to be one of the strong bottom neck in the deliberation.

Another commercialization connecting with a private company dealing with high technology is worth mentioning. This company produces electronic parts - circulator & separator for microwave equipment & the company met with good, solid success story. The products are well accepted world wide, amongst the customers are United States NASA program. In this endeavour, the technology belong to the company, but Ministry of Science, Technology and Energy through TISTR join in with capital (for a certain period of time) plus direct assistance in management and directive policy of the company. Related enterprise dealing with solar cell production is also being set up with TISTR involvement.

4. Linkage of R&D Institute and Industry

The question of having good rapport with the industry is something that needed to be taken seriously. One of the major endeavous for R&D institutes is the establishment of linkage with universities or basic research institutions on one hand and the private enterprises or industries on the other. Such linkage is significant regarding the understanding between bonafide academicians and the practical, profit oriented industrialists. Applied research relatively meaningful to industrialist can not be easily realized by the serious researchers. Another point worth mentioning is the question of building credibility of the institution. This problem may be most difficult to realize in earnest if we do not really know what actually the industries want.

Linkage through "liason reach out unit" which should be set up in each IRSI; employing on a part time basis, a number of personnels who are presently working or having a good linkage (from association or board members) selected from various business fields. Another linkage that can be realized is the exchange of personnels through project operation or new technique training between institutions and various industries.

There are three very important issues directly relevant to industrial demand, these are information, money and new improved technology.

Industrialists need information, any up-to-date information about new marketing channels movement of business trend, new technology, improved procedures etc. In the regional or global setting, information can be obtained through a net work which will be set up or improving any existing information co-ordinating body in the region.

Another linkage that always hold true in any situation is the linkage through "funding". This financial set up could be operated on a reciprocal basis between IRSIs or industries. IRSIs may operate as joint venture or may invest some capital in promoting certain relevant industries, particularly in small & medium size industries. Industries on the other hand can give out on contract research basis for any problem solving type of sturdy or exploring in various new fields or new technologies.

Any new improved technology will affect industry tremendously, particularly if competitor get hold of it. If IRSI has or develops new technique or new technology, it will definitely improve its bargaining power or credibility up to the point where linkage can be most effective and lasting.

5. The present trend

In Thailand, recently strong popularization of science and technology has been most effective. People from all walk of lives as well as politicians have had a better & more awareness of the impact of science and technology to the country and to everyday life. The Ministry of Science, Technology and Energy which only came into existance since 1979 opts its operation, apart from creating awareness in S&P briefly into the following:- Assists in enacting new laws to assist and promote S&T overall, increasing funds from both government budget and foreign assistances for various promoting activities, and direct operation with the main thrust through TISTR which is the only non-profit making public enterprise organization in the Ministry.

TISTR direct its operation into building capability and credibility in the selected fields relevant to the immediate needs of the nation. The two major emphasis will be the role in research and development and the role in services relating to science and technology.

The role in research and development will cover 4 main issues:-

1. TISTR R&D program shall cover all disciplines with direct response towards sturdy and strong development with self reliance as well as keeping abreast with the world particularly in the industrial sector.
2. All research will direct at applying the research result towards production of goods both local and foreign.
3. All R&D operation should be comprehensive covering from R&D to engineering design and industrial production or commercialization.

4. All R&D aims at creating technolcgical capability of the nation by self developing or improve imported technology to attain higher efficiency and to retain the technology to the country. The 5 roles in S&T services will cover the following issues:-

   1. A centre for information, digesting and assimilation of technology is urgently needed to improve & function in f ll.
   2. A centre for engineering consultant is set up to assist in major government or big private development projects, particularly in designing and consulting.
   3. Giving service in contract research and development for industries and any other feasibity or environmental impact studies.
   4. Giving services in quality controls, standard and equipment testings. Building reliability and capability in testing and certifying materials and equipment for both government and private concerns.
   5. Giving service in engineering design from bench or pilot scale to production scale in order to creating self reliance in important factory materials & equipment.

In total, the present trend in science and technology in Thailand, direct at building capability in the country so that ultimately, we can be prosperous, rich, sturdy and strong nation with self reliance and able to abreast with the developed world.

6. Conclusion

Commercialization of the research and development results is not an easy task but it is indispensable in the context of developing countries. Stronger efforts from government and private sector alike are needed to build a concerted effort in obtaining capability in R&D as well as relevant services through the completion of the cycle of achievement. Thai is from research and development through bench scale and pilot scale, following with engineering design with prototype development and finally into industry with production and marketing demand.

In Thailand, TISTR met with mix success in commercialization of the research results in the past. The present set up with strong deliberation of S&T popularization prompts the stronger linkage through IRSI and Industry with the improve capability and credibility. Support through meaningful S&T policy and planning from the authority concerns is indispersable for any deliberation in S&T anywhere.