SCIENCE AND TECHNOLOGY INDICATORS

IN THAILAND

FOR

STEPAN MEETING

IN SRILANKA

JULY 10 - 14, 1989

BY

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STEPAN MEETING ANNOUNCEMENT

Title : Development of Practical S&T Indicators for Economic Development

Date : 10 - 14 July 1989

Venue : Natural Resources, Energy and Science Authority

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SRILANKA

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Science and Technology Indicators In Thailand

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1. General Background of Science and Technology Situation

The status of science and technology policy has perceptibly advanced in Thailand over the recent years which was firstly mentioned in the 1949. Constitution Article 65 of which states that "the government should encourage research in arts and sciences". The same statement was repeated in article 61 of the 1968-Constitution. Later Article 74 of the 1974 - Constitution and article 61 of the 1978 - Constitution repeated that "the government should encourage research in arts and sciences and promote the application of science and technology for national development.....".

During the First National Economic and Social Development Plan period (1961 - 1966) the concern of science and technology was significantly on the building up of the economic infrastructure : construction of highways, irrigation dams, power plants, etc., based on the reliance of foreign advance technologies from developed countries. In the Second National Development Plan period (1967 - 1971) the emphasis was placed upon the increase in the national science and technology potential for industrialization. In the Third Plan (1972 - 1976), attention was called to the development of science and technology manpower. Moreover, the Technology and Environment Planning Division was set up under the National Economic and Social Development Board (NESDB) to formulate the science technology and environment plan. In the Fourth Plan (1976 - 1981), science and technology development was taken as one of the major development strategies and Ministry of Science, Technology and Energy (MOSTE) was accordingly established as the central science and technology policy making, planning, coordinating and promotional body of the government. In the Fifth Plan (1982 - 1986) the emphasis was on the use of science and technology to increase efficiency in production leading to export promotion and import reduction.

2. Science and Technology Organizational Structure and Network

The national science and technology organizations can be divided into 3 levels : policy and plan formulation, promotion and implementation.

In the private sector, the three levels of operation exist simultaneously in a few large companies. Only the main organizations which mostly are in the government sector will be briefly mentioned here.

Chart 1 shows the stepwise procedure of present science and technology planning

Chart 2 shows the relationship among main organizations in policy and plan formulation, promotion and implementation

In addition, there are government agencies related to science and technology such as Ministry of Agriculture and Co-operatives, Ministry of Industry, Ministry of Public Health, Ministry of Education, Ministry of University Affairs, Ministry of Communication, Ministry of Finance etc. However, the main organizations for science and technology development are as follows :

(1) Ministry of Science, Technology and Energy (MOSTE)

At national level, the Ministry of Science, Technology and Energy (MOSTE) and the National Economic and Social Development Board (NESDB) are the two major agencies which are responsible for national science and technology policy-making.

MOSTE consists of 7 departments and 1 state enterprise (Chart 1) with a total of 5,733 officials and a 1983 budget of 1,538.9 million baht. The organization of MOSTE is as follows :

1.1 Office of the Secretary to the Minister
1.2 Office of the Permanent Secretary for Science, Technology and Energy
1.3 Department of Science Service
1.4 The National Research Council
1.5 Office of the National Environment Board.

1.6 Office of the Atomic Energy for Peace

1.7 The National Energy Administration

1.8 Thailand Institute of Scientific and Technological Research.

MOSTE is the central organization which is responsible for the formulation of policy, plan and projects on science, technology, energy and environment ; the monitoring control and regulation of science, technology, energy and environment operations ; the updating and improvement of plans and projects ; the development of endogeneous technology for production and marketing ; the service and promotion of technology transfer both domestically and internationally ; the study and analysis and arrangement of data on science, technology, energy and environment and the collection and dissemination of information on science, technology, energy and environment research and development.

(2) Office of the National Economic and Social Development Board (NESDB)

NESDB, is under the Prime minister's Office as the national planning agency, has the main functions to suggest and advice on economic and social development matters to the Cabinet; to give consideration on the national economic and social development plan and other matters to the Cabinet ; to give comments on economic and social development activities as requested by the Prime Minister and to coordinate with related government organizations on plan and development project formulation as well as implementation. The Office regularly surveys, studies and analyzes the economic and

social situation ; sets up the national economic and social development plan ; considers various projects along the target of the national economic and social development plan ; follows up and evaluates the national economic and social development plan implementation and projects.

There are 14 divisions in NESDB. One of its 14 divisions is Technology and Environment Planning Division which has the function of co-ordinating the science and technology plan with the National Economic and Social Development Plan. NESDB has a staff of 619 and a 70.2 million baht budget for 1980. The organization of NESDB is shown in Chart 4.

Other organizations related to science and technology

(1) Science and Technology for Development Project and Science and Technology Development Board (STDB)

Science and Technology for Development Project is a cooperative project between United States of America and Thailand, administered by the Science and Technology Development Board which has an autonomous status, although it is formally under Thailand Institute of Scientific and Technological Research. This project aims at increasing the efficiency and expanding the scope of science and technology application both in the public and private sectors for national development. The emphasis of this project is on solving the problems related to 3 fields of high priority technology of Thailand namely bioscience and biotechnology, material technology, and applied electronic technology. STDB will strengthen the capability of related

institutes ; develop the science and technology policy formulation; promote research, development and engineering; and support the industrial development in verious ways.

(2) Thailand Development Research Institute (TDRI)

Thailand Development Research Institute is autonomous organization working on policy research of various projects which are useful for policy formulation for national development. This institute supports and performs policy research on agricultural, rural, industrial, trade and international economic, macro-economic policy, natural resources and environment, human resource and social development, science and technology development, and infrastructure and energy policy. The support is done by means of providing development research information services to the government and private organizations as well as the public ; establishing network of policy organizations and researchers ; promoting the coordination among numerous research institutes both domestically and internationally; disseminating research output to be used as guidelines in formulating policy for solving the urgent and long term problems of the nation.

(3) National Centres for Specific Fields of Science and Technology

The National Centre for Genetic Engineering and Biotechnology, the National Centre for Metallurgy and Material Technology, and the National Centre for Electronics and Computer Technology are under the Office of the Permanent Secretary, Ministry of Science, Technology and Energy. Their functions are to set up the national plans in specific technologies and support research and development projects of the network institutes the centres are

directed by Policy Boards appointed by Cabinet and, controlled at the operational level by the Executive Committees. These centres cooperate with other organizations both on the policy formulation level and support level.

(4.) Office of the National Research Council

The Office of the National Research Council is a department under the Ministry of Science, Technology and Energy. It is responsible for research promotion policy at the natural level ; the promotion and support of both scientific and social research; the coordination with government and private agencies; and the cooperation with international research institutes and researchers. The Council, with 10 subject areas of responsibility, has the Prime Minister as chairman, the Deputy Prime Minister as vice-chairman, the Secretary-General of the Council as secretary. In addition, another committee in this Office called "National Research Council Executive Committee" is composed of chairmen of the subject areas and other qualified persons appointed by Cabinet.

(5.) Thailand Institute of Scientific and Technological Research

Thailand Institute of Scientific and Technological Research is the only one state enterprise under the Ministry of Science, Technology and Energy. It is responsible for conducting research and giving service to public, state enterprise and private organizations for national economic and social development; doing research on science and technology for appropriate use of

natural resources ; disseminating scientific and technological research output for the use of agricultural, industrial and commercial purposes of the nation ; monitoring and giving service on science and technology

2. The Present Science and Technology Policy

The national science and technology policy being implemented during the Sixthe Development Plan period (1987-1991) in Thailand comprises 4 items as follows :

1. To promote and enhance the utilization of science and technology for the efficiency increase in production, industrial and agricultural product value, energy, environment and natural resource management, and national defense.

2. To strengthen the research and development and technology transfer, administrative organizations to be able to mobilize science and technology manpower both within the country and from abroad as well as from the private sector for the production and marketing development.

3. To elevate the methodologies and mechanisms in administering the science and technology information system in order to increase the efficiency of private sector for international competitiveness.

4. To develop science and technology manpower continuously to be in line with the economic and social development.

3. Basic Issues and Problems of Policy Formulation

Thailand, like other developing countries, was confronted with various problems as follows :

3.1 The statistical data on science and technology are scattered in various agencies and they were collected without systemic process. Because of this deficiency, the majority of private and public sectors had no opportunity to get access to all the information needed to formulate S & T policy and plan as well as to select the technologies available in Thailand.

3.2 The country still lacked adequate human resources development and skills in S & T field.

3.3 There is no linkage of S & T data collected by the government and private agencies in research and development. Therefore these data has not yet been fully utilized for S & T development.

4. Science and Technology Indicators

In developing and using science and technology as well as formulating the policy, plan and project, it is necessary to have relevant data and information in making decision, setting the goals and guidelines for the policy implementation. Therefore, formulation and evaluation of science and technology policy require some indicators to measure. Indicators can be classified into two main categories : input and output indicators. Input indicators include budget for research and development and manpower for science and technology. Output indicators show the results of S & T including the number of scientific publications, patents and some justification such as the total value added of technology-intensive products.

In Thailand, the study of S & T indicators has depended on the present been cursory and without systematic process. The main agency which plays a major role in collecting statistical data should be the National Statistic Office. In practical terms, the National Statistic Office has not really engaged in compiling S & T data especially on R & D. Therefore, all statistical data are scattered in various agencies namely the National Economic and Social Development Board (NESDB) the National Research Council, Bank of Thailand, Board of Investment and also some socio-economic data in the National Statisitcal Office. However, the coordination among these agencies has not reached the satisfactory level.

In order to solve the problems in S & T indicators, MOSTE presently tries to compile those data by means of reviewing literature, interviewing and despatching the questionnaires to all government agencies and private sectors. The following activities are shown as follows :

Input Indicators

(1) Research and Development expenditures

Thailand R & D expenditures mostly come from the national budget. The expenses on R & D activities in the private sector are very small. From the statistics of the National Research Council collected from the reports of the government's annual budget, the total of R & D expenditures include both the research and survey budget. Therefore, R & D expenditure has been over-estimated.

The government policy on research and development budget has been indicated in the National Economic and Social Development Plans. The Target of the national R & D budget was set up to be 0.5 percent of Gross-National Product (GNP) in the Fifth National Plan (1982-1986). Recently, in the Sixth National Plan has mentioned 2 percent of GNP of industrialized countries.

Table 1.1 shows R & D and survey budget in comparison with GNP and the government budget during 1975 - 1986. According to the comparative study, it appears that Thailand's R & D budget has been very low and was only 0.19 percent of GNP in 1986.

Table 1.2 shows R & D expenditure budget by agencies. MOST of the governmental R & D expenditure budget has been allocated to Ministry of Agriculture and Co-operatives.

Table 1.3 shows R & D expenditure budget by fields. From this figure, it can be seen that the biggest share of the budget has been allocated to agriculture, industry and energy and natural resource development, while only minor portions were alloted to other fields.

Table 1.4 shows R & D expenditure budget by all sources of funds during 1983 - 1986

For the private sector, there are only few data available at present on the role in doing and supporting R & D. Generally, the private sector has had very little role in R & D and never informed the government of their R & D expenditure. However, the survey done by MOST in 1983, for the first time gave a glimse of the picture of R & D activities contributed

by the private sector. The total of 105 companies which are members of the Association of Thai Industries, and represent a major fraction of large and medium-size companies concerned with a wide cross section of industry in Thailand, showed from this survey that their annual expenditure for R & D amounted to 240.7 million baht, while the annual sale amounted to 58.3 million baht. The percentage of the annual sale spent on R & D is therefore 0.4 percent. On the close inspection, however, it is found that most of the R & D expenditure (139.0 million baht) was reported from only one company dealing with rubber and rubber products. Substracting this from the total figure yields the result of less than 0.1 percent of the annual sale being spent on R & D, a figure reflecting the very low interest in R & D in private sector.

(2) S & T Manpower In Thailand, the majority of institutions which perform S & T activities are government agencies such as universities, government departments, institutes of technology, technical schools, etc. MOSTE and NSDB have conducted S & T manpower survey in both government and private sectors.

Thailand's human resources in science and technology are low compared to those of a more technologically developed country such as Japan, South Korea. In 1984, MOSTE estimated Thailand's science and technology human resources, including technicians, to number 97.78 per 10,000 people, whereas a UNESCO report revealed that in 1981 South Korea's science and technology workforce for the same population base was 524.8

The production of human resources has not followed the changes in the economic structure towards increasing production, efficiency and service. Higher education still concentrates on producing social science graduates. Moreover in the field of science an technology itself there is a lack of cooperation between entre preneurs and academic institutes.

The supply of human resources in the science and technology field does not match demand in the labour market. Surveys of the private and public sector show there is a much higher demand for personnel in the engineering field than there is in a field of science and agriculture, but the number of graduates in these 3 fields is almost equal.

Table 2.1 shows the number of researchers by fields in 1982. The majority of researchers worked in the field of social science and agriculture with a total of 1,542 persons.

Table 2.2 shows the number of students in state educational institutions in various fields in 1985.

In 1984, MOSTE conducted science and technology manpower survey both in the government and private sectors in various educational leveles. The purpose of this survey was to find out accurate the stock, demand and supply of science and technology manpower. However, since the task of statistical compilation and analysis like manpower surveys and forecasts is quite difficult, especially in the private sector, and there has no effective mechanism nor legal regulation for data collection. therefore, the figure of manpower in the private sector was unavailable and the demand of manpower categorized by industry was also unknown. The result of survey was shown in the following tables.

Table 2.3 shows the number of S & T manpower in government sector (both degree and below degree levels) produced in Thailand during 1978-1982. It can be seen from the table that over 70% of the total S & T manpower are found in engineering field, about 20% in natural science, while less than 10% are in agricultural science field.

Table 2.4 and 2.5 shows the manpower production of universities and public colleges during 1978-1982. The amount of graduates in engineering with university degrees has slightly increased by 42% from 1,164 in 1978 to 1,658 in 1982, and increase of 10% annually. Below degree level, the number of engineering graduates is very high rate, particularly in comparison with the number of natural science.

Table 2.6 shows the number of S & T manpower categorized by sectors in 1981 which are government : state enterprise : educational institutes = 46 : 44 : 10

Table 2.7 shows the total number of employees in 105 private companies which is approximately 66,000 the percentages of S & T manpower are 2.2% (degree level) and 6.9% (below degree level). This table also an estimate demand for additional manpower in the next five years, and there is very little demand for manpower with high qulifications in private sectors. This reflects the weakness in S & T capacity in private sector.

Table 2.8 shows the number of employed manpower by industrial sectors. It appears that the proportion of employment that the proportion of the agricultural labour force is the highest. Therefore, we pay attention to the demand of scientific and technolbgical manpower in industrial sector.

Table 2.9 shows S & T manpower in ASEAN Countries. From this table, we can see that there are the biggest amount of S & T manpower and technician in Korea per 10,000 labour force while those in Thailand are the fewest.

(3) Technology Transfer

Another important indicator is the amount of technology import payment. Thailand has been importing technologies for industrial product for more than 50 years until now. Yet there remains our government agency to deal directly with technology transfer. Data collection, thus, for technology import is hardly feasible. Technology Transfer Centre under MOST realizes that those data are useful for negotiating technology cost. The studies are based on available data which comes from the National Bank (Table 3.1). Such values include royalties, patent fee and the changes for technical know-hows (Table 3.2, 3.3, 3.4, 3.5, 3.6) which totalled up to US$ 253 million during 1972-1981.

Table 3.7 shows the total payment for technology import during 1972-1984. It is found that the currencies approved for private technology import increased about 12 fields from 142 million baht in 1972 to 1,893 million baht in 1982.

Output Indicators

The result for S & T activities can be measured by counting numbers of scientific publications, citation, patents and also technological balance of payments. This measurement may not be the best since they have not indicated the output of scientific services, but this is the only acceptable parameter at present.

(1) S & T Publications

For Thailand and other developing countries, there are still some difficulties in counting S & T publications or authors since there is no principal core to compile these statistics systematically in the country. Therefore, it is necessary to rely on international indexing services namely the Institute for Scientific Information ' ISI) in the US. which is the only international yardstick nowadays. The distribution of output from various institutions in Thailand since 1977, based on ISI data, has been shown in table 3.8 Mahidol University, Chulalongkorn University and the internationally run Asian Institute of Technology are the largest producers of the covered publications only 13 institutions are significant of this output. There was a growth of 103% in publications over the six-year period.

Table 3.9 shows that 13 scientific institutions in Thailand, including all universities with major science programs, have published in journal of the Science Society of Thailand over the past 15 years. Mahidol University and Chulalongkorn University are again the largest contributors, accounting for 35% and 15% of all published articles respectively.

Table 3.10 shows the subject-wise distribution of research papers based on the titles of journals in SCI 1979 and 1980.

The outcome of technological activities can be estimated by the number and types of patents, the amount of royalty obtained from export of technology, the income from export of technology intensive products. For Thailand, the

patent system has just started a few years ago when the Patent Act was promulgated in 1979. Therefore, there are only 146 palents granted up to March 1984 out of over 2,400 applications. However, it is imperative to continue collecting patent data since it can indicate the result of technological activities in the country.

Table 3.11 shows the amount of technology import payment in the form of royalty, trademark, technical and management fees. It can be seen that royalty is listed as the biggest payment followed by technical fees, management fees, and trademark respectively. The payments are classified by industries and shown in Table 3.12

(2) Palent

The Number of Patent Applicants

During 1982-1986, there are 4,393 patent applicants in Thailand which consists of 971 Thai people and 3,422 foreigners (Table 3.13)

Out of the total 4,393 patent applicants, 1,819 of them applied in chemistry, them 1,456 and 1,181 of them applied industrial product and engineering respectively. Besides, the proportion of foreign applicants is higher than Thai, particularly in chemistry. During 1982-1986, the number of patent applicants in chemistry is 53 Thais and 1,766 foreigners, in engineering is 197 Thais and 984 foreigners, and in industrial product is 721 Thais and 735 foreigners.

(3) The Number of Thai Patentees

During 1932-1986, the government agencies has approved and given patent to 444 Thais and foreigners (10%) out of 4,393 applicants which is very small number. Among the patentees, 208 of them are Thais and 236 of them are foreigners. The patentees are mostly in product design field for 318 persons, then in chemistry for 71 persons, and in engineering for 55 persons.

Table 3.13 shows the number of patent applicants during 1932-1986. The majority of them (1,819 persons) apply for patent in chemistry, then 1,452 persons apply in engineering fields.

Table 3.14 and 3.15 shows the number of Thai patentees. Of the total 444 patentees, 208 persons are Thai and 236 persons are foreigners.

(4.) S & T Information

Though Thailand has no national scientific and technological information system, there are information systems with specific S & T components in the following sectors :

Agriculture - Kasetsart University is a participating agency of Agricultural Information Bank of Asia (AIBA) in the International System for the Agricultural Science and Technology (AGRIS), UN/FAO's Information Network System.

Environment - The Office of the National Environment Board is the national focal point of the International Referral System for Source of Environmental Information (INFOTERRA).

Energy - Renewable Energy Resources Information Center (RERIC) which is under the Asian Institute of Technology.

- Technical and Foreign Relations Division is the national point of Sub-Regional Network of New and Renewable Sources of Energy in Asia and the Pacific.

For scientific and technological data services, the Ministry of Science, Technology and Energy provides scientific and technological data, with the following objectives :-

1. To improve capability of the management level in MOSTE for policy making and plans.
2. To provide science and technology information needs to users such as researchers, scientists, technicians etc.
3. To promote research studies for scientists and technicians all over the country.

MOSTE consists of 7 departments and 1 state enterprise (see the organization chart) as follows :-

1. Office of the Secretary to the Minister.
2. Office of the Permanent Secretary for Science, Technology and Energy.
3. Department of Science Service
4. The National Research Council.

5. Office of the National Environment Board.
6. Office of the Atomic Energy for Peace.
7. The National Energy Administration.
8. Thailand Insitute of Scientific and Technological Research.

MOSTE has provided the information flow as appeared in figure 1 which enable users to acquire relevant data and information.

Let me now give you some briefings about what the departments concerned operate in relation to information systems.

1. The Office of the Permanent Secretary for Science, Technology and Energy, there is a MINISIS software package which operates on HP-3000 series mini-computer. The MINISIS software has been used for keeping track of their bibliographic data, scientific and technological manpower, data analysis of technology transfer, research in progress, S & T journals and textbooks.

2. Department of Science Service, Division of Scientific and Technological Information (DSTI) has compiled the following information :-

- Patents
- Trade
- Equipments
- Standards

This division will be developed to the National Science and Technology Information Coordination Centre for National Information System (NIS), with the aim of providing relevant information to form bibliographic database.

5. The National Research Council (NRC) has compiled the following information :-

- Technological Utilization for Industrial Development Research
- Technological Utilization for Agricultural Development Research
- Technological Utilization for Energy Research
- Technological Utilization for Environment and Natural Resources Management.
- Technological Utilization for Defense
- Public Health Research
- Philosophical Research
- Laws and Political Science Research
- Economic Research
- Social Science and Demography Research
- Researcher Directory
- Research Institute Directory.

6. The Office of the Atomic Energy for Peace (OAEP) has set up and developed nuclear information systems.

5. Thailand Institute of Scientific and Technological Research (TISTR) has set up and developed information systems of scientific and technological research and development so as to facilitate the implementation of its institute and at the same time to render services to industry and agriculture sectors to utilize science and technology for processing development.

6. The Office of the National Environment Board (NEB) has set up and developed environment information. The office will thus be able to provide information concerning major problems and trends which will enable high-level officials to utilize the information for policy-making and planning purposes.

7. The Office of the National Energy Administration (NEA) has set up and developed energy information.

Thus, the Office of the Permanent Secretary for Science, Technology and Energy is concerned as a coordinating centre of this information network which will have the following main duties :

- To provide training personnel with knowledge information network systems.
- To provide basic maintenance and set up database.
- To create contralized index on the library and compile information in form of directory
- To create databases which are not available anywhere also in MOSTE.

To achieve the objectives, the Coordinating Committee on Science and Technology Information Network should be established. This committee will have the authority to set up the standards of hardware, software and even manpower in order to enable MOSTE to exchange information with other countries and make it possible for information flow in this network.

For the long term plan, this information network is planned to link with other information centres available both in Thailand and abroad.

6. Conclusion

The Ministry of Science, Technology and Energy, which is the main organization in formulating the policy, plan as well as coordinating the works related to science and technology of the country, has collected various data and information in this report for the benefit of private and public organizations. The summary on the details are as follows :

R & D budget

Research and development budget and activities of the nation since 1975 are presented and analyzed. The Fifth (1982-1986) and the Sixth National Plans (1987-1991) stated that the target of research and development budget should have reached 0.5% of GNP and 2% of the fiscal budget.

S & T manpower

The status of scientific and technological manpower both in educational and employment systems is assessed with respect to policy and measures for scientific and technological manpower planning both in macro and micro levels. The report shows that during 1978-1982 the majority of graduate students in science and technology are from engineering field, then agriculture and science respectively.

Technology Transfer

It has been reflected in data on royalty payment and patent. It was found during the past 4 years (1982-1985), the number of applicants for inventory and research on science and technology content has significantly increased. Besides, the technology import payment has also increased by 8% annually, mostly for royalty and technical fee for automobile, food and beverage, and electrical appliances.

These indicators have enabled us to justify science and technology development in Thailand. It is obvious that the national development for science and technology will be performed hesitatedly. Therefore, further action on various information and data are necessary. In order to obtain more meaningful and reliable information and indicators, comparative study on international science and technology indicators should be performed. This study will give trends and direction for national science and technology development.

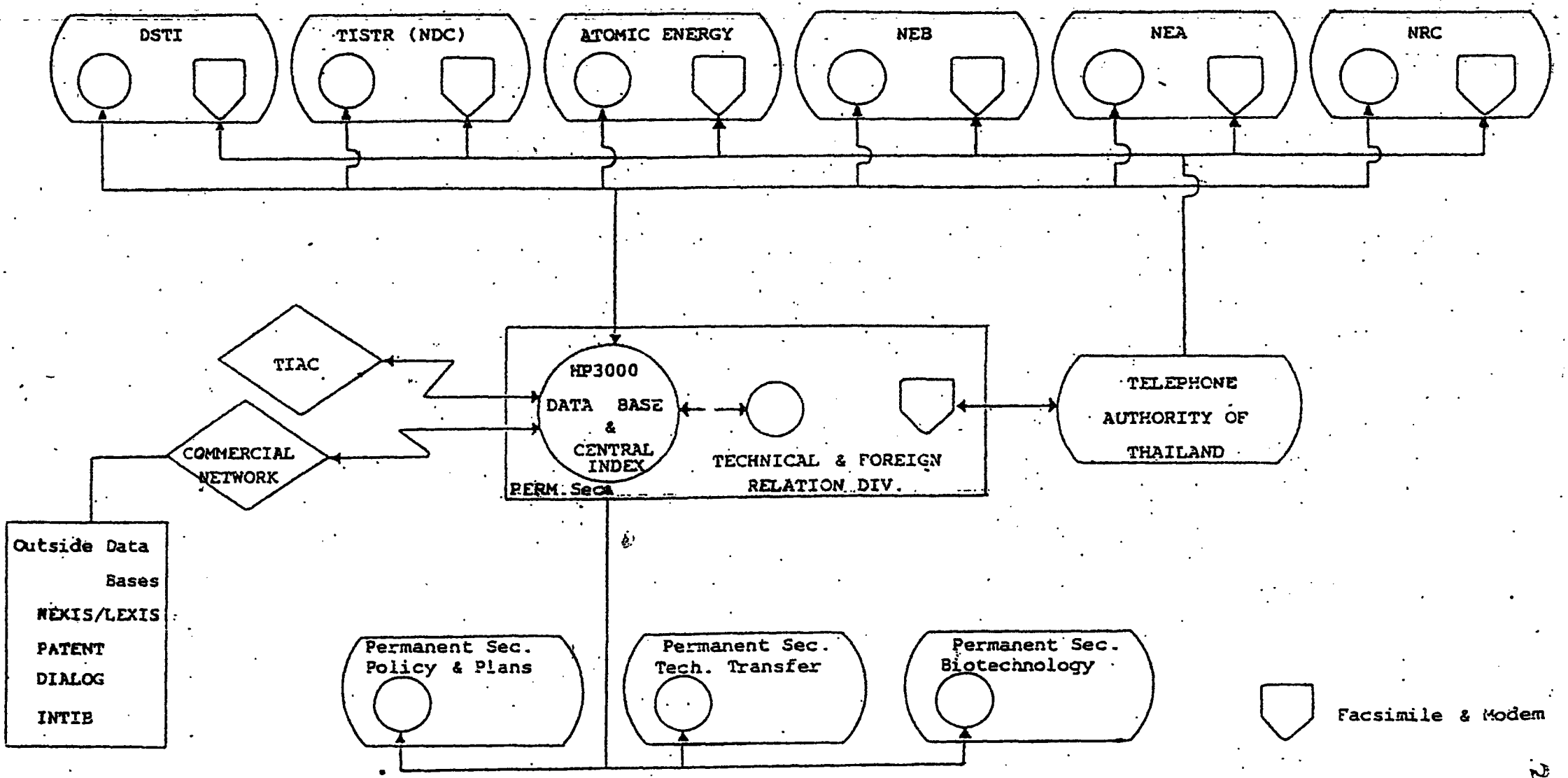

FIGURE 1. INFORMATION FLOW

Chart 1 The stepwise procedure of present S & T planning

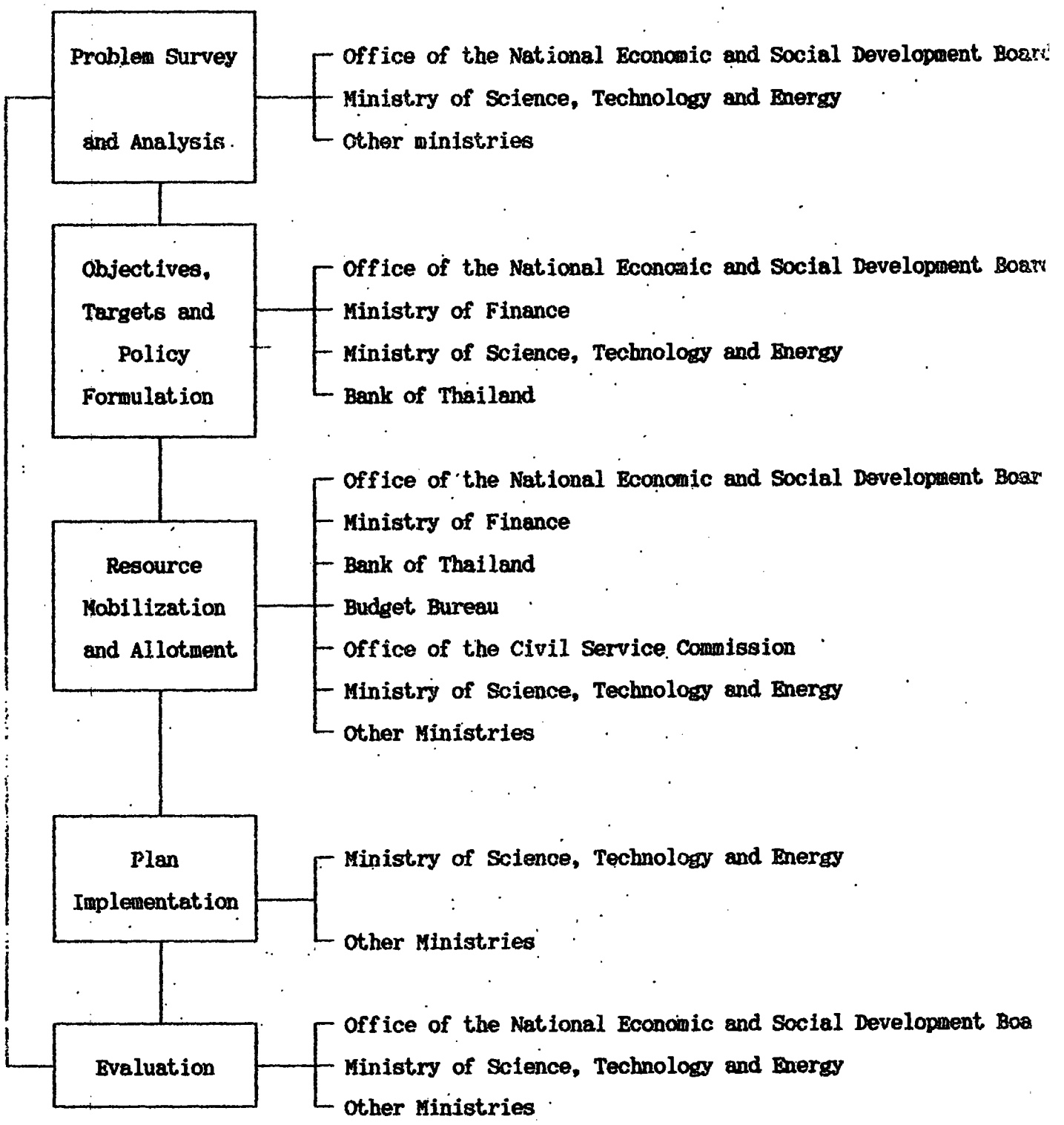

Chart 2 The Realtionship among main organizations in policy and plan formualtion, promotion and implementation

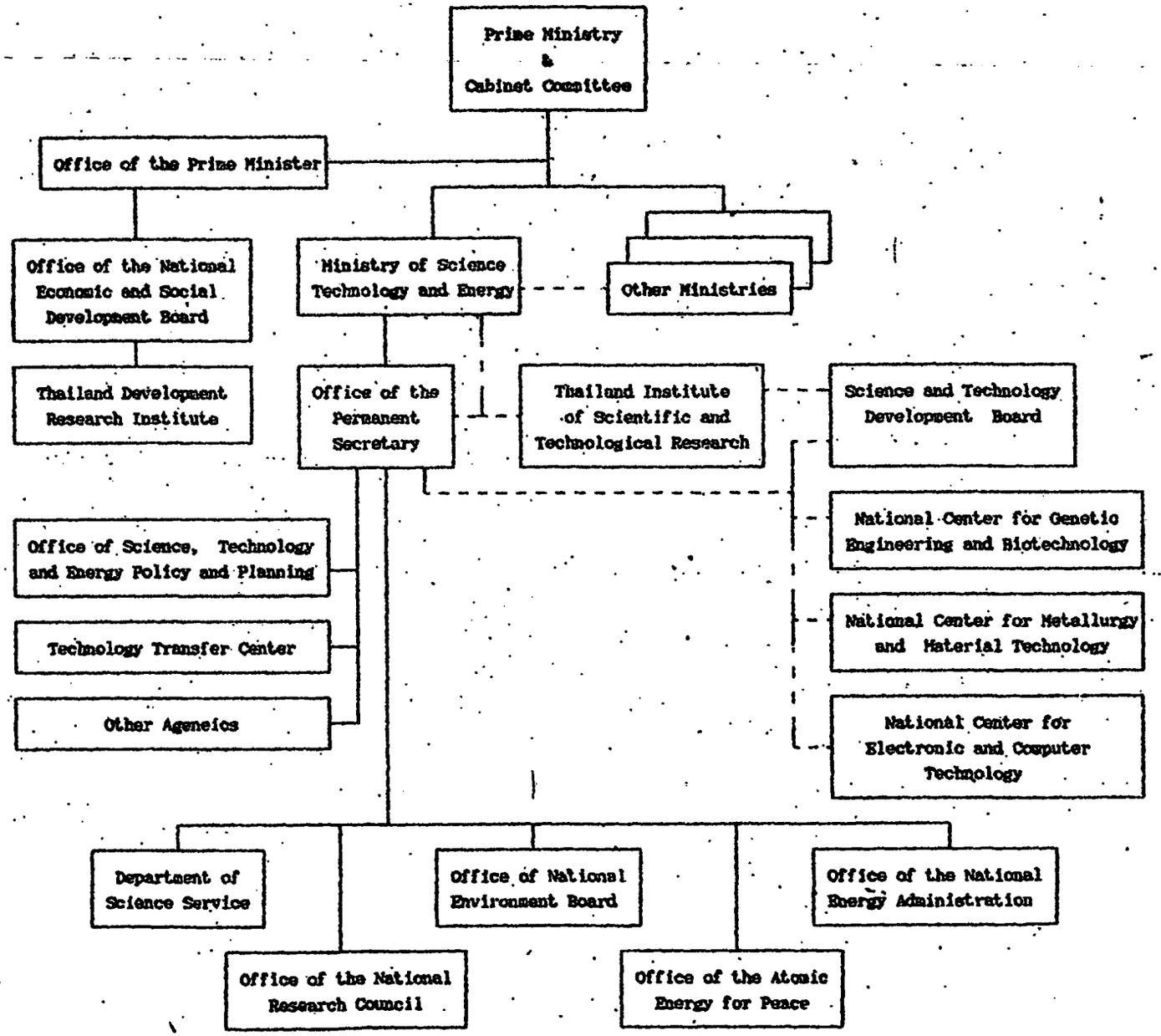

Chart 3 Organization Chart of Ministry of Science, Technology and Energy

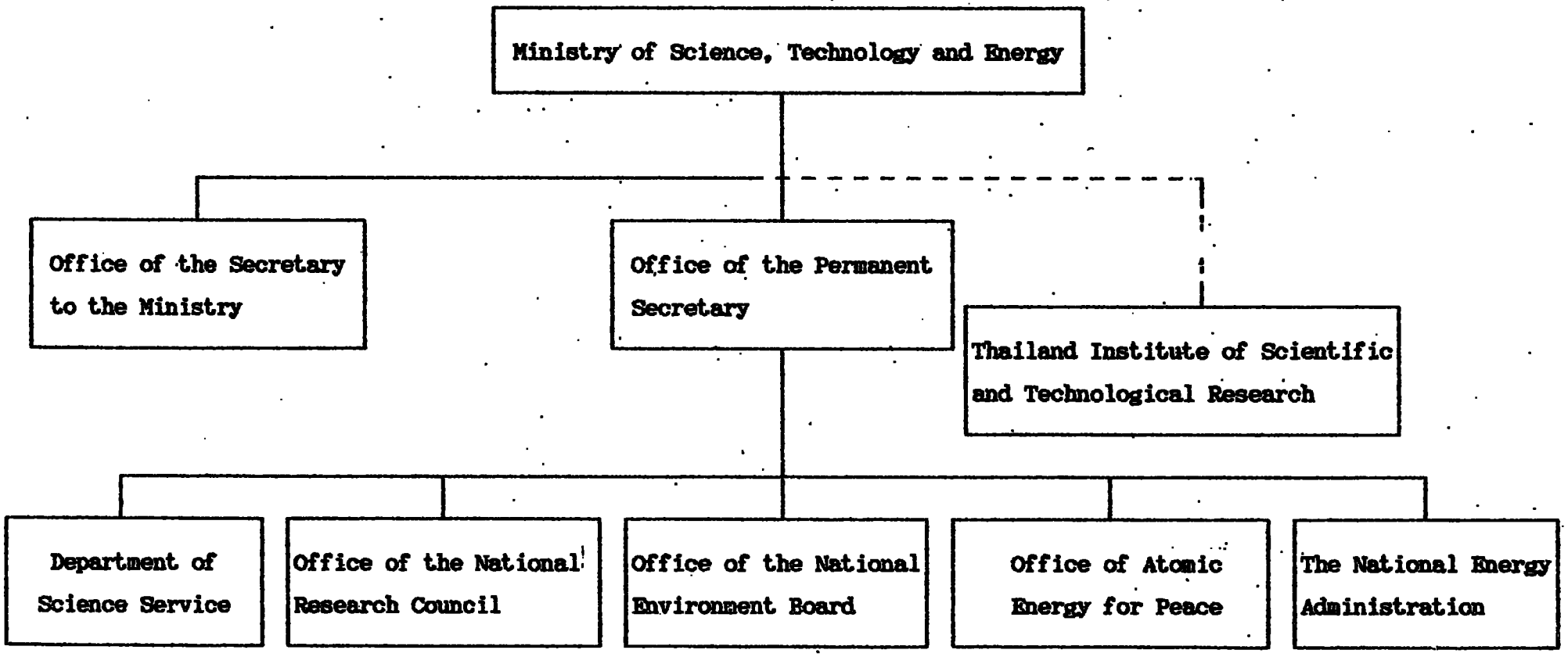

Chart 3(A) Office of the Permanent Secretary

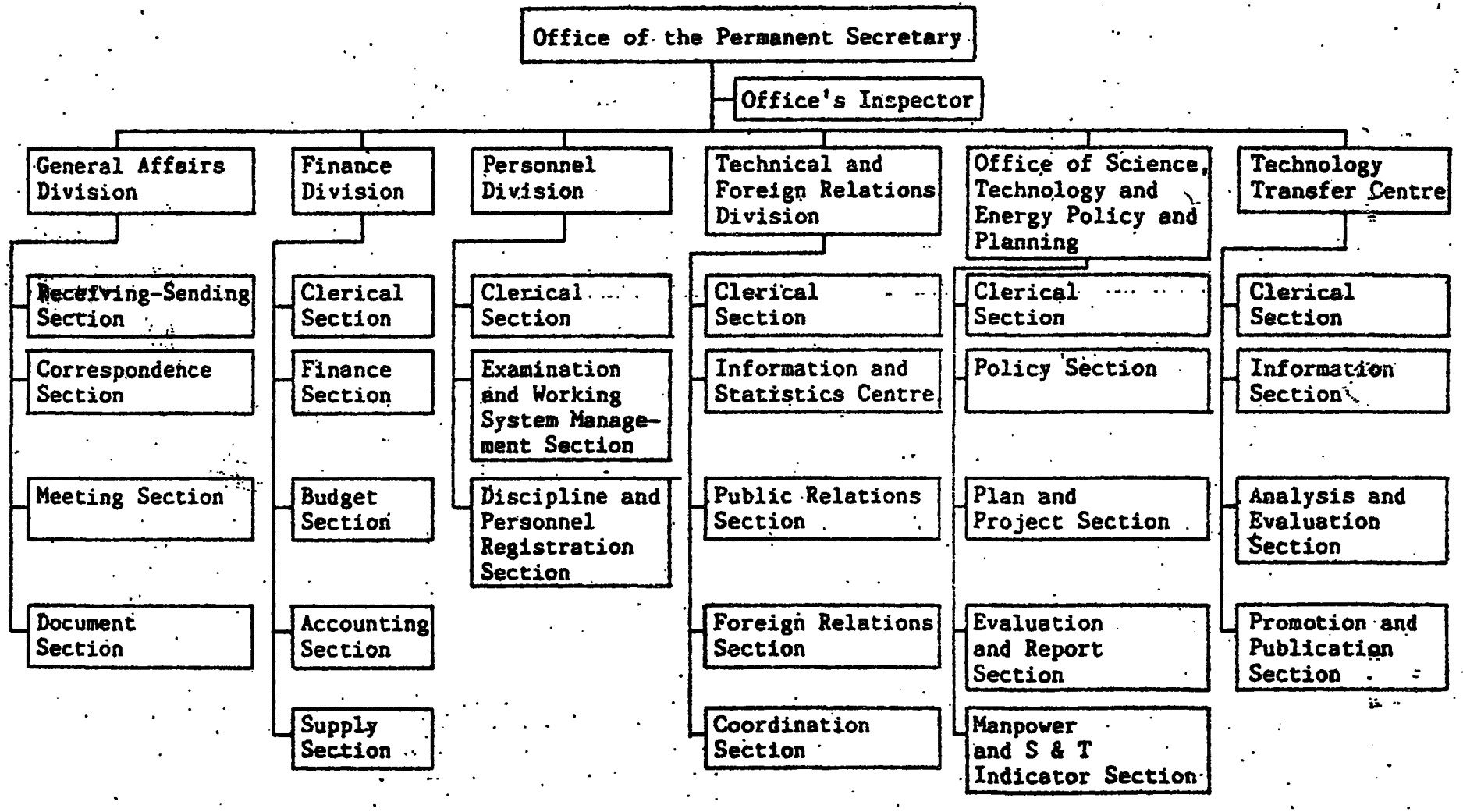

Chart 3(B) Office of Science, Technology and Energy Policy and Planning

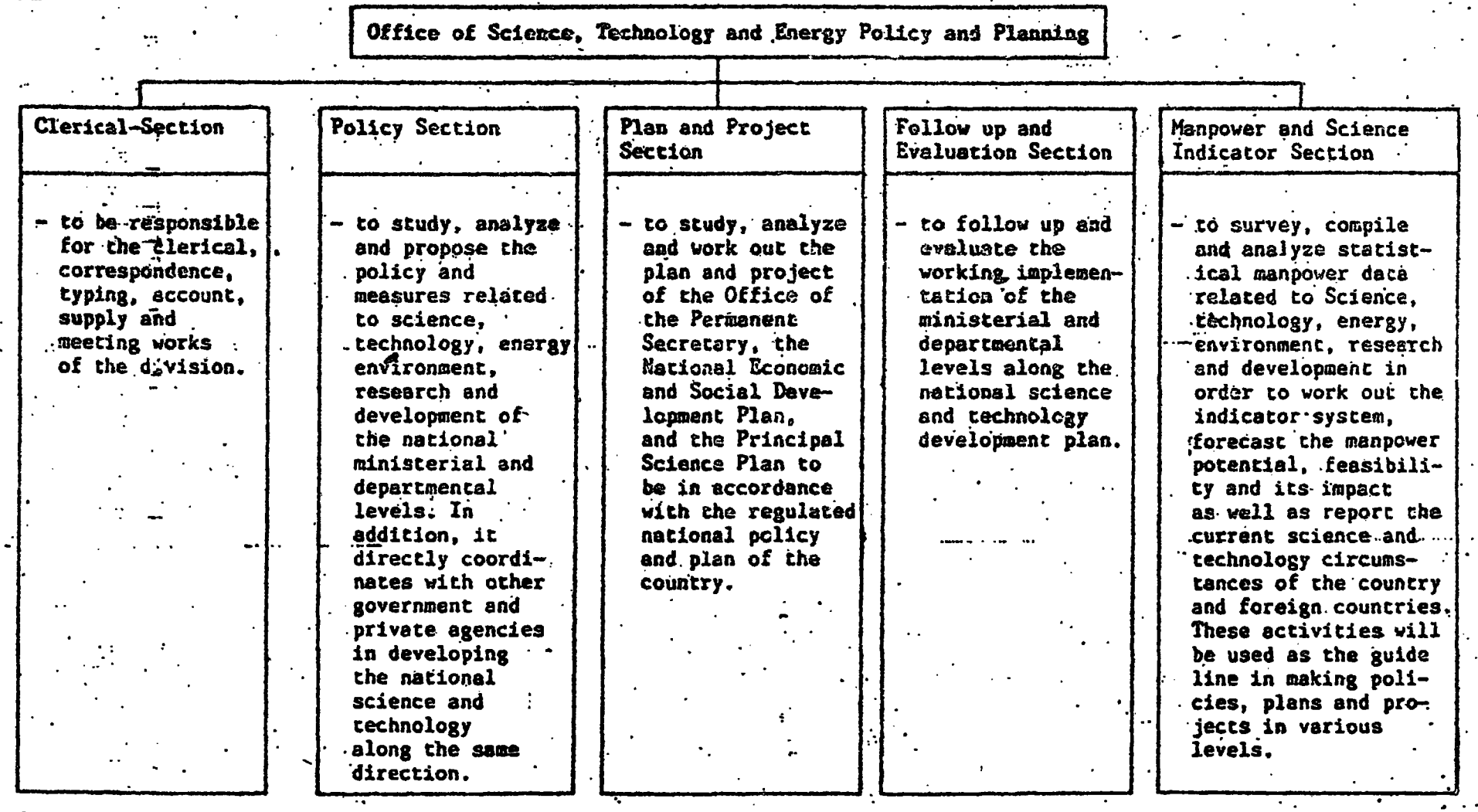

Chart 4 Organization chart of the National Economics and Social Development Board

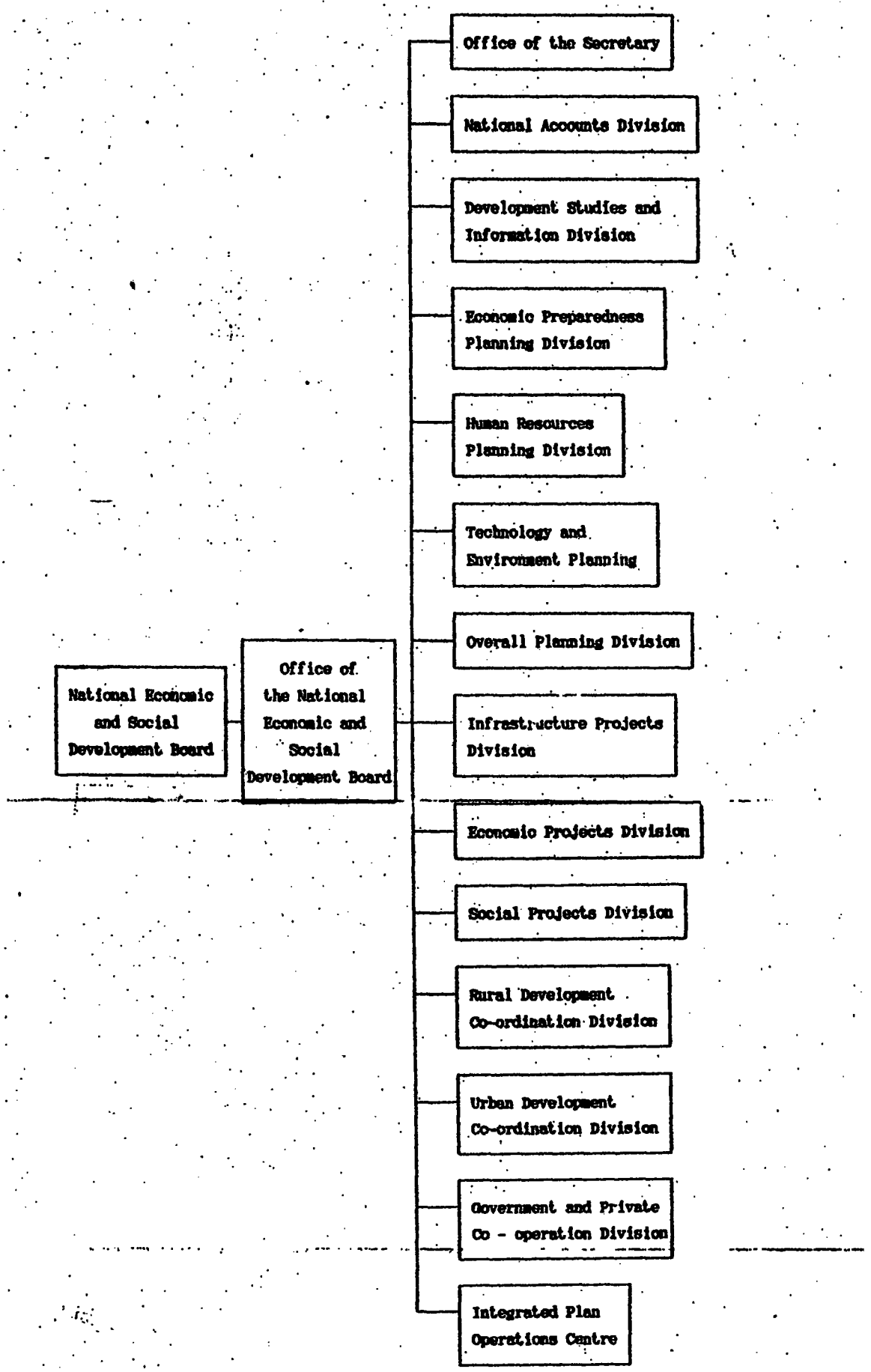

Table 1.1 R&D and survey government budget in comparision with GNP and the total government budget during 1975-1986

unit : million baht

Year	Gross National Product (GNP)	Government Budget	R&D and Survey Budget			
			Total	% of GNP	% of Gov. Budget	+ from 1975
1975	298,676	48,000	1,191	0.938	2.48	-
1976	338,472	62,650	1,166	0.346	1.86	- 0.62
1977	391,115	68,790	1,277	0.326	1.86	- 0.67
1978	464,549	81,000	1,468	0.316	1.81	- 0.67
1979	546,448	92,000	1,331	0.243	1.45	- 1.03
1980	672,420	109,000	1,507	0.224	1.38	- 1.10
1981	764,401	140,000	2,549	0.333	1.82	- 0.66
1982	819,750	161,000	3,271	0.399	2.03	- 0.45
1983	899,543	177,000	1,856[2]	0.813	0.94	- 1.54
1984	957,087	192,000	2,104	0.219	1.09	- 1.39
1985	1,000,435	209,000	2,416	0.241	1.15	- 1.33
1986	1,055,762	218,000	2,020	0.191	0.93	- 1.55

Remarks
1. R&D and survey budget on science and social science of government agencies and state enterprises.
2. The figure of R&D and survey budget of the Royal Thai Army is not available in 1983.

Sources :
1. Office of the National Economic and Social Development Board.
2. Office of the National Research Council.

Table 1.2. R&D budget by ministries.

unit : million baht

MINISTRIES / AGENCIES	FISCAL YEAR											
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1.OFFICE OF THE PRIME MINISTER	133	185	177	173	158	86	105	155	92	37	31	7
2.MINISTRY OF DEFENCE	0	0.07	3	135	161	185	222	816	7	76	19	14
3.MINISTRY OF FINANCE	21	43	7	0	0	0.2	22	26	12	10	2	0
4.MINISTRY OF FOREIGN AFFAIRS	0	24	32	0	0	0	0	0	0	0	0	0
5.MINISTRY OF AGRICULTURE AND COOPERATIVES	556	558	611	798	565	664	1040	1029	816	1332	1317	1111
6.MINISTRY OF TRANSPORT AND COMMUNICATIONS	185	48	84	55	84	109	207	173	79	27	42	22
7.MINISTRY OF COMMERCE	30	31	39	14	28	28	54	48	36	12	43	8
8.MINISTRY OF INTERIOR	39	59	60	41	33	36	121	139	188	118	48	97
9.MINISTRY OF JUSTICE	0	1	0	0	0	0	0	0.5	0.6	0.05	0	0
10.MINISTRY OF SCIENCE, TECHNOLOGY AND ENERGY	-	-	-	-	-	93	319	180	76	52	118	121
11.MINISTRY OF EDUCATION	27	25	16	11	24	14	37	168	31	25	34	38
12.MINISTRY OF PUBLIC HEALTH	57	50	109	77	111	87	85	78	72	29	63	49
13.MINISTRY OF INDUSTRY	66	68	71	97	109	128	227	130	120	291	439	297
14.MINISTRY OF UNIVERSITY AFFAIRS	48	43	51	44	47	53	108	259	107	71	172	188
15.STATE ENTERPRISES	28	30	17	23	11	14	2	63	9	24	63	68
16.OTHERS	3	0	0	0	0	0	0	7	0	0	25	0.2
TOTAL	1191	1165	1277	1468	1331	1507	2549	3271	1655	2104	2416	2020

Source : Office of The National Research Council

Table 1.3. R&D budget by fields.

unit : million baht

FIELDS	FISCAL YEAR								
	1978	1979	1980	1981	1982	1983	1984	1985	1986
1.AGRICULTURE	797	559	661	1024	1097	920	1783	1464	1188
2.INDUSTRY AND ENERGY	109	131	141	248	147	128	717	783	573
3.NATURAL RESOURCE DEVELOPMENT	2	2	3	151	51	17	31	370	534
4.ENVIRONMENT AND CONSERVATION	15	25	22	29	25	54	16	109	50
5.COMMERCE AND SERVICE	0	27	27	61	40	39	62	163	148
6.COMMUNICATION AND TRANSPORTATION	48	64	107	170	172	68	51	46	27
7.SCIENCE AND TECHNOLOGY	101	97	82	208	175	n.a	n.a	n.a	n.a
8.SOCIAL DEVELOPMENT	43	37	44	145	183	86	280	99	164
9.EDUCATION, RELIGION AND CULTURE	21	23	9	52	175	35	87	128	210
10.MEDICAL SCIENCE AND PUBLIC HEALTH	79	121	87	74	117	130	105	178	225
11.NATIONAL DEFENCE	137	164	200	222	824	0.3	42	16	14
12.POLITICAL SCIENCE AND ADMINISTRATION	0	0	0	0	0	3	12	4	7
13.PUBLIC ADMINISTRATION	0	0	0	0	0	109	13	113	5
14.BASIC STATISTICS AND GENERAL RESEARCH	116	81	110	116	249	n.a	n.a	n.a	n.a
15.OTHERS	0	0	14	49	16	66	96	n.a	n.a
TOTAL	1468	1331	1507	2549	3271	1655	3295	3473	3145
% OF GNP.	0.31	0.24	0.22	0.33	0.39	0.18	0.34	0.35	0.30
% OF GOVERNMENT BUDGET	1.81	1.45	1.38	1.82	2.03	0.94	1.72	1.66	1.44

Remarks : 1.Budget from the government

2.Budget from the government, Non-government and foreign countries

3.n.a-figure is not available

Source : Office of The National Research Council

Table 1.4. R&D expenditure budget by all sources of funds during 1983 - 1986

unit : million baht

Year	Sources of Fund	R & D and Survey Performers						Total	
		Gov. Agencies		State Enterprise		Private Agencies			
		R&D and Survey	% of Total	R&D and Survey	% of Total	R&D and Survey	% of Total	R&D and Survey	% of Total
1983	Government Budget	1,647	77.5	9	0.4	0	0	1,656	77.9
	Non-Gov. Budget	0	0	20	0.9	34	1.6	54	2.5
	Foreign Countries	393	18.5	23	1.1	0	0	416	19.6
	Total	2,040	96.0	52	2.4	34	1.6	2,126	100.0
1984	Government Budget	2,104	63.9	0	0	0	0	2,104	63.9
	Non-Gov. Budget	0	0	123	3.7	22	0.7	145	4.4
	Foreign Countries	998	30.3	48	1.4	0	0	1,046	31.7
	Total	3,102	94.2	171	5.1	22	0.7	3,295	100.0
1985	Government Budget	2,353	67.8	63	1.8	0	0	2,416	69.6
	Non-Gov. Budget	4	0.1	154	4.4	323	9.3	481	13.8
	Foreign Countries	495	14.3	81	2.3	0	0	576	16.6
	Total	2,852	82.2	297	8.5	323	9.3	3,473	100.0
1986	Government Budget	1,952	62.1	68	2.2	0.3	0.0	2,020	64.3
	Non-Gov. Budget	123	3.9	86	2.7	64	2.0	273	8.6
	Foreign Countries	794	25.3	58	1.8	0	0	852	27.1
	Total	2,869	91.3	212	6.7	64	2.0	3,145	100.0

Source : Office of the National Research Council

Table 2.1 Number of researchers by fields in 1982.

FIELDS	NUMBER OF RESEARCHERS	%
1. NATURAL SCIENCE	967	18.44
2. ENGINEERING AND TECHNOLOGY	338	6.46
3. AGRICULTURE	1,401	26.77
4. MEDICAL SCIENCE	985	18.82
5. SOCIAL SCIENCE	1,542	29.47
TOTAL	5,233	100

Source : Office of the National Research Council.

Table 2.2 Number of students in state educational institution in various fields, 1985.

FIELDS	NUMBER OF STUDENTS	%
HUMANITIES	24,270	3.6
EDUCATION	96,551	14.3
FINE ARTS	1,378	0.2
SOCIAL SCIENCES	306,652	45.4
LAW	168,242	24.9
ENGINEERING	13,925	2.1
NATURAL SCIENCES	23,380	3.4
MEDICAL SCIENCE AND HEALTH SCIENCE	24,651	3.6
AGRICULTURE	15,673	2.3
OTHERS	1,209	0.2
TOTAL	675,931	100

Source : Ministry of University Affairs.

Table 2.3: S & T Manpower by Educational Fields during 1973 - 1982

Year	Natural Science			Agricultural Science			Engineering			Total		
	Total	M	F	Total	M	F	Total	M	F	Total	M	F
1973	817	380	437	3,133	2,724	409	10,659	10,448	211	14,609	13,552	1,057
1974	705	430	355	3,031	2,539	492	12,511	12,331	180	16,327	15,300	1,027
1975	877	452	425	3,036	2,601	435	12,172	11,918	254	16,085	14,971	1,114
1976	969	515	454	3,160	2,768	392	16,161	15,908	253	20,290	19,191	1,099
1977	1,132	589	543	3,722	3,117	605	21,619	21,248	371	26,473	24,954	1,519
1978	1,119	558	561	4,777	3,862	915	24,151	23,723	428	30,047	26,143	1,904
1979	1,199	593	606	6,249	4,889	1,360	21,493	21,069	424	28,941	26,551	2,390
1980	1,815	911	904	6,638	5,212	1,426	22,192	21,639	553	30,645	27,762	2,883
1981	1,887	927	960	6,408	5,088	1,320	23,240	22,722	518	31,535	28,737	2,790
1982	1,326	741	585	7,250	5,796	1,454	23,867	23,439	428	32,443	29,976	2,467
	11,926	6,096	5,830	47,404	38,596	8,808	180,065	184,445	3,620	247,395	229,137	18,258

Table 2.4 Science and Technology Graduates (degree level) produced in Thailand in 1978 - 1982

Fields	1978	1979	1980	1981	1982
1. Natural Science	1,077	1,160	1,783	1,882	1,294
2. Agricultural Science	1,100	1,323	1,432	1,377	1,380
3. Engineering	1,164	1,270	1,542	1,632	1,658
Total	3,341	3,753	4,757	4,861	4,202

Table 2.5 Science and Technology Graduates (Below degree level) produced in Thailand in 1978 - 1982

Fields	1978	1979	1980	1981	1982
1. Natural Science	42	39	32	35	32
2. Agricultural Science	3,677	4,926	5,206	5,031	5,920
3. Engineering*	22,987	20,223	20,650	21,608	22,209
Total	26,706	25,188	25,888	26,674	28,161

*Engineering include technicians and craftsmen

Source : Annual Report of Educational Institutes

Table 2.6 S & T Manpower in Each Sector by Field in 1981

Field \ Sector	Government Sector	State Enterprise	Educational Institutes	Total
1. Agriculture	13,195	4,977	2,389	20,561
2. Natural Science	6,311	1,507	3,948	11,766
3. Engineering	29,026	40,222	3,734	72,982
Total	48,532	46,706	10,071	105,309

Source : Ministry of Science, Technology and Energy

Table 2.7 Manpower for Science and Technology in the Private Sector in Thailand

Total number of companies surveyed : 105

	Below degree level	Bachelor degree	Master degree	Doctoral degree	All degree levels
PRESENT STOCK					
Natural Science	395	197	9	3	207
Agricultural Science	167	70	6	1	77
Engineering	3,353	967	140	6	1,113
Medical science	10	75	7	2	84
Total	3,925	1,309	162	12	1,483
ADDITIONAL REQUIREMENT DURING NEXT 5 YEARS					
Natural science	2	25	2	0	27
Agricultural Science	0	19	0	0	19
Engineering	429	226	11	2	239
Medical science	0	0	0	0	0
Total	431	279	13	2	285

Table 2.8 The Number of Employed Manpower by Industrial Sectors

Year	Total of all Industries	Primary Industry (Agriculture)	Secondary Industry	Ore Mining	Construc -tion	Manufac -turing	Tertiary Industry	Commerce	Transportation and Communication	Services	Others
1962	13,772,104	11,334,382	589,408	29,568	68,813	471,027	1,616,649	779,904	187,474	655,271	251,669
	(100.00)	(82.20)	(4.13)				(11.74)				(1.83)
1970	16,652,267	13,201,901	950,769	86,674	181,477	982,640	2,353,690	875,798	293,685	1,184,207	145,912
	(100.00)	(79.28)	(5.70)				(14.13)				(0.89)
1980	22,523,700	15,942,600	2,261,000	36,500	435,800	1,288,700	4,318,700	1,915,800	515,600	1,886,800	500
	(100.00)	(70.78)	(10.04)				(19.17)				(0.00)
1982	24,831,200	16,984,000	2,591,100	64,400	520,200	2,006,500	5,253,600	2,298,100	577,100	2,378,000	400
	(100.00)	(68.40)	(10.43)				(21.16)				(0.00)

Source: Report on Population and Estate Housing Survey National Statistical Office, 1960 - 1970
Report on Labour Survey in Thailand, 1980, 1983

Table 2.9 S & T Manpower in ASEAN Countries

Country	Year	Total	S & T Manpower	Technician	S & T Manpower and Technician per 10,000 labour force
Brunei	1981	6,515	2,214	4,301	330.7
Indonesia	1976	1,217,874	95,339	1,122,535	78.6
Malaysia	1970	35,415	.....	.....	25.3
Philipines	1980	.....	1,083,742	.....	
Singapore	1969	64,719	38,259	25,920	256.7
Thailand	1969	67,632	20,288	47,344	13.8
Burma	1969	.....	18,500	.....	.....
Korea	1981	2,025,639	94,171	1,931,468	524.8

Source : Unesco 1984, from Chee Peng Lim, " New Technologiess in Asian: Challenge and Response" paper presented at the International Seminar on World Strutural Change II, Oct 21-27, 1985 Human Resource Institute Thammasat University

Table 3.1: Summary table showing major channels of transfer of technology

(million baht)

year	Total Foreign inveatment	Total import of capital goods	Number of contractual agreement	Outward remittance of profits and dividend.
1960	-	1,465.0	2	
1961	-	1,458.0	2	
1962	-	1,960.0	1	
1963	-	2,468.0	4	
1964	-	2,509.0	1	
1965	-	2,922.0	3	
1966	570.6	3,538.0	5	
1967	894.4	4,837.0	5	
1968	1,239.7	5,615.0	8	333.2
1969	1,057.5	6,184.0	11	516.5
1970	890.5	6,557.0	16	575.8
1971	808.4	6,191.0	13	584.6
1972	1,427.1	6,885.0	26	565.5
1973	1,604.3	8,756.0	46	645.5
1974	3,336.4	14,152.0	33	902.3
1975	1,744.8	15,445.0	35	1,410.1
1976	1,614.1	13,777.0	31	1,612.7
1977	2,163.8	17,331.0	48	1,635.3
1978	1,010.8	23,095.0	52	1,660.7
1979	1,047.7	27,670.0	40	1,971.7
1980	3,816.0	33,898.0	43	2,049.1
1981	6,363.2	36,709.0	18	3,406.1
1982	4,338.6	35,436.0	3	2,714.2
1983	3,008.4	53,581.0	n.a	2,714.8
No date recorded			53	
Total	42,436	332,439	512	23,299

Source : Bank of Thailand

Table 3.2 Thailand: Outward Remittances of Management, Copyrights and Patent Royalties by Country

(Percentage)

country	1973	1974	1975	1976	1977	1978	1979	1980	1981	Average 1973-81
Japan	40.9	41.4	50.5	41.7	38.1	41.6	33.7	42.1	33.5	40.4
United States	34.4	27.0	22.3	32.6	33.9	29.6	27.4	28.1	43.4	31.0
United Kingdom	8.7	14.0	22.3	7.1	5.1	5.9	4.8	3.6	3.4	7.0
Hong Kong	1.5	2.6	2.7	1.6	2.6	2.0	2.5	5.3	2.0	2.5
Germany	2.4	-	1.7	3.6	1.9	3.0	3.2	2.7	3.5	2.4
Others	14.1	14.1	11.5	13.4	18.4	17.9	28.4	18.2	14.2	16.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source : Office of the National Research Council.

Table 3.4 Thailand : Remittances of Technology Fees classified by Type of Payments

(US $ million)

Type of Remittances	Year	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	Total	%
Royalties		5.16	7.68	9.67	12.06	12.82	18.01	17.12	22.59	28.42	37.23	170.76	67.39
Technical Fees		1.56	1.96	1.39	2.51	4.70	4.63	7.34	9.27	13.45	19.68	66.49	26.24
Trademark Fees		0.06	0.06	0.03	0.01	0.24	0.07	0.63	0.94	0.22	0.16	2.47	0.97
Management Fees[a]		-	-	-	-	-	2.24	1.69	2.33	3.68	3.92	13.86	5.40
Total		6.78	9.70	11.12	14.58	17.76	24.75	26.78	35.13	45.77	61.01	253.38	100.00

a: No record between 1972-1976.

Source : same as table 10

Table 3.4 Thailand: Methods of payments classified by Industries
(number of contracts)

ISIC	Industries	Running royalties	Fixed fees per unit output	Lumpsum fixed fees	Others	Total
311-2	Food	25	5	4	2	36
313	Beverages	1	2	1	-	4
314	Tobacco	1	1	-	-	2
321	Textiles	9	3	16	-	26
322	Weaving apparel	13	1	2	-	14
324	Footwear	2	-	-	-	2
341	Paper and paper products	2	-	3	1	
342	Printing, publishin:	2	-	3	-	5
351	Industrial chemicals	18	3	8	1	30
352	Other chemical products	41	6	2	13	62
353	Petroleum refineries and products	-	5	3	1	9
355	Rubber products	5	-	1	-	6
356	Plastic products	1	-	1	1	3
361	Pottary, china and earthenware	2	-	-	-	2
362	Glass and glass products	6	-	1	-	7
369	Non-matallic mineral products	3	-	2	1	6
371	Iron and steel	-	-	5	-	5
372	Non-ferous metal	1	-	2	-	3
381	Metal products	1	1	3	1	6
382	Machinery except electrical	10	3	3	4	20
383	Electrical machinery and appliances	23	1	-	4	28
384	Transport equipment	20	5	2	6	33
385	Other machinery	1	-	-	-	1
	Service activities	16	-	8	24	48
	Total	223 (57.47)	36 (9.28)	70 (18.04)	59 (15.21)	388 (100.00)

Source : Bank of Thailand

Table 3.6 Technology fees classiffed by industry

Industry	1980		1981	
	m.baht	%	m.baht	%
Chemicals and chemical products	22.6	2.4	27.5	2.1
Blactrical appliances	59.1	6.3	85.6	6.4
Cosmetic	102.5	10.9	187.4	10.3
Petroleum products	23.7	2.5	148.0	11.1
Batteries	4.9	0.5	6.3	0.5
Pharmacauticals	79.6	8.5	95.6	7.2
Rubber products	61.3	6.6	74.4	5.6
Transport equipment	127.6	13.6	166.8	12.5
Paints	10.9	1.2	9.95	0.7
Textiles	55.03	5.9	87.5	6.6
Food and beverages	110.8	11.8	164.3	12.4
Others	278.9	29.9	327.3	24.6
Total	936.9	100.0	1,330.73	100.0

Source : Bank of Thailand

Table 3.6 Thailand : Imports of Machinery, Outward Remittances of Management Fees, Copyrights, Patent Royalties, Profits, Dividends and Net Inflow of Direct foreign Investment (1972-81)

	1972	1973	1774	1975	1976	1977	1978	1979	1980	1981	Total or Average
1. Imports of mechinery (million US dollers)	301.0	403.1	664.9	720.7	635.4	791.5	1,066.1	1,273.6	1,529.6	1,565.9	7,385.3
2. Total remittances of management fees, patent royalties and technical assistanee fees(million US Collars)	6.79	9.70	11.12	14.57	17.75	24.74	26.78	35.12	45.76	60.99	253.32
3. Percentage increase of technology fees	-	42.86	14.64	31.03	21.83	39.38	8.25	31.14	30.30	33.28	23.88
4. Ratio of total remittances to imports of machinery	0.023	0.024	0.017	0.020	0.023	0.031	0.025	0.023	0.030	0.038	0.026
5. Net inflow of direct Investment (million US dollars)	68.19	78.77	188.28	85.53	79.12	106.07	49,57	51.29	184.97	276.66	1,168.4
6. Ratio of total remittances of management fees and The like to Net Inflow	0.10	0.12	0.06	0.17	0.22	0.23	0.54	0.68	0.25	0.22	0.26
7. Remittances of profits and dividends (million US dollars)	27.04	31.26	44.31	69.12	97.05	80.16	81.45	96.59	99.33	148.09	756.32
8. Ratio of total remittances of management fees and other technology fees to total remittances of profits and dividends	0.25	0.31	0.25	0.21	0.22	0.31	0.33	0.36	0.46	0.41	0.31

Source : ESCAP/UNCTC Joint Unit on TNCs

Table 3.7 Technology Import Payment in Thailand 1972 - 1984

(billion baht)

Year	Technology Import Payment
1972	142.02
1973	200.25
1974	226.53
1975	298.89
1976	362.20
1977	504.71
1978	549.87
1979	729.19
1980	936.60
1981	1,831.20
1982	1,586.85
1983	1,993.41

Source : Bank of Thailand.

Table 3.8 International publications in science and technology from Thailand

Institution	Number of publications			
	1977	1979	1981	1983
Mahidol University	86	102	106	131
Chulalongkorn University	21	33	42	39
Chiang Mai University	15	8	17	8
Kasetsart University	2	6	7	9
Silpakorn University	0	5	1	8
Khon Kaen University	3	4	7	7
Prince of Songkla University	1	4	5	6
King Mongkut Institute of Technology	6	15	4	4
Thailand Institute of Scientific and Technological Research	2	1	3	2
Ministry of Science, Technology and Energy	0	0	3	2
Ministry of Agriculture	1	5	9	16
Ministry of Public Health	1	4	9	14
Asian Institute of Technology	12	17	27	25
Others	3	34	27	46
Grand total	153	238	269	318

Source : Institute for Scientific Information, U.S.A.

Table 3.9 Institutions within Thailand publishing in Journal of the Science Society of Thailand 1975 - 1984

Institutions	Total	From single institutions	Collaborative
Mahidol University	60	43	23
Chulalongkorn University	46	34	12
Prince of Songkla University	15	7	8
Asian Institute of Technology	13	10	3
Silpakorn University	10	3	7
Chiang Mai University	9	6	3
Ministry of Science, Technology and Energy	6	2	4
Khon Kaen University	5	2	3
Kasetsart University	4	3	1
King Mongkut's Institute of Technology	3	1	2
Ramkhamhaeng University	1	1	0
Thailand Institute for Scientific and Technological Research	1	1	0
Institute for Promotion of Science and Technology Teaching	1	1	0
Ministry of Education	1	1	0
Srinakarinwirote University	1	1	0
Ministry of Public Health	1	0	1
Armed Forces Research Institute of Medical Science	1	0	1
Bank of Thailand	1	0	1
Total	185	115 (62%)	70 (38%)

Table 3.10 Subject-wise distribution of research papers from ASEAN countries based on the titles of journals

	Total number of papers in SCI 1979 and 1980				
	Indonesia	Malaysia	Philippines	Singapore	Thailand
Medical Sciences	109	174	77	125	233
Physical Sciences	10	43	-	25	35
Agricultural Sciences	9	51	82	-	36
Biological Sciences	8	47	10	18	15
Chemical Sciences	8	83	13	18	35
Engineering & Earth Sciences	22	10	9	29	23
Mathematical Sciences	4	19	-	22	8
Food Science & Technology	-	8	9	-	-
Environment Sciences	-	6	7	-	12
Veterinary Sciences	-	-	29	-	-
Others	12	11	5	21	90
Total	182	452	241	258	447

Includes papers published in Journal of Science Society of Thailand

Table 3.11 Payments Made for Technology Importation Classified by Types of Payment 1978 - 1983

(million baht)

Year	Royalty	Trademark	Technical	Management	Total
1978	347.3	12.8	149.3	34.4	543.8
1979	461.3	19.2	189.2	53.5	723.1
1980	581.5	4.4	275.4	75.3	936.6
1981	812.3	3.8	429.5	85.5	1,131.2
1982	861.3	9.8	390.1	181.4	1,442.9
1983	887.1	46.5	468.6	163.7	1,565.8

Source : Bank of Thailand

Table 3.12 Payments Made for Technology Importation Classified by Industries 1978 - 1983

(million baht)

Industry	1978	1979	1980	1981	1982	1983
Chemical	-	18.1	22.6	27.5	36.3	42.9
Electrical Goods	36.9	44.0	85.1	85.7	57.4	129.6
Cosmetic	43.8	70.5	102.5	137.4	130.2	143.7
Petroleum Products	15.6	32.7	23.7	148.0	37.6	56.5
Battery	5.9	4.4	4.9	6.3	6.9	10.4
Pharmaceutical	53.7	79.5	79.3	96.0	113.9	103.3
Rubber Products	47.7	55.1	61.3	74.4	72.3	75.3
Automobile and Spare Parts	59.1	104.9	127.6	166.8	176.8	241.3
Paint	6.4	6.9	11.1	9.9	7.5	16.1
Textile	52.1	34.7	54.9	87.5	95.5	112.8
Food & Beverage	41.4	92.5	110.8	164.3	162.4	222.9
Other	181.1	179.9	278.9	327.3	487.8	411.2
Total	543.9	723.1	936.6	1331.2	1442.9	1565.8

Source : Bank of Thailand

Table 3.13 The Number of Patent Applicants during 1982 - 1986

Types / Year	Engineering		Chemistry		Industrial Products		Total		Total
	Thai	Foreigner	Thai	Foreigner	Thai	Foreigner	Thai	Foreigner	
1982	36	124	4	207	87	100	127	431	558
1983	35	191	12	322	141	131	188	644	832
1984	36	227	12	393	182	192	230	812	979
1985	46	237	9	415	129	153	184	805	989
1988	44	205	16	429	182	159	242	793	1035
Total	197	984	53	1766	721	735	971	3485	4456

Source: Ministry of Commerce

Table 3.14 The Number of Thai Patentees

Fiscal year	Engineering		Chemistry		Product Design		Total
	Thai	Foreigners	Thai	Foreigners	Thai	Foreigners	
1982	1	1	-	1	6	46	55
1983	3	1	1	6	14	27	52
1984	6	7	1	9	19	19	61
1985	4	3	1	7	71	16	102
1986	12	17	1	44	68	32	174
Total	26	29	4	67	178	140	444

Source: Ministry of Commerce

Table 3.15 The Number of Patent Applicants and Patentees in Thailand

Unit:person

Year	Thai		Foreigners		Total	
	Applicants	Patentees	Applicants	Patentees	Applicants	Patentees
1982	127	7	431	47	558	55
1983	188	18	644	34	832	52
1984	230	26	749	35	979	61
1985	184	76	805	26	989	102
1986	242	81	793	93	1035	174
	971	208	3422	236	4393	444

Source :Ministry of Commerce