The Role of Technology in Economic Development:
The Korean Case*

by Chan Jin Kim**

I. Introduction

The role of foreign capital in the Korean economic development since 1962 has drawn some academic as well as journalistic attention in recent years. (1) Technology is considered one important element of foreign capital and its transfer across national border raises various legal problems as in any type of international transaction such as contract, governing law, application of recipient country's industrial property law, means of payment and exchange control, and territorial limitation on export. It is worthwhile to shed some light on the role of technology in its path to growth and on the legal framework for the transfer of technology. This study is quite meaningful because technology has been one major factor in the process of economic growth so far but because the demand for advanced technology is even greater than before in Korea's drive to achieve heavy and high technology industries.

In the 1960s, national effort concentrated on laying the foundation for industrialization, and major emphasis in capital investment was placed on building

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infrastructures and on import substitution and export-oriented light industry plants. The 1970s, however, saw the introduction of more complex and heavier industries requiring higher levels of technology. During the period of 17 years (1962～78), the real growth rate of gross national product (GNP) marked 9.4 percent per annum, exports grew at a rate of 40.2 percent annually and industrial production virtually expanded by about 20 percent per annum. In 1979, per capita GNP exceeded 1,600 dollars and exports were above 15 billion dollars.

This is not meant to imply that the future of Korean economy is all but rosy. Due to the overexpansion of the economy during the last several years, especially in the area of heavy industry and its resulting inflationary pressure, protectionist measures such as import restraint or quota taken by developed countries, and a sharp deterioration in the current account of the balance of payments, our economic situation is clearly less favorable than at any time in the recent past. From 1979, we are experiencing a period of economic stagnation coupled with continued high rate of inflation. In order to correct the situation and to put the economy back to normal, i.e., seeking a high growth rate during the 1980s, the government decided to take several measures. A program of import liberalization was initiated in the second half of 1978. A stabilization program including tight monetary and fiscal policies has been in effect since April 1979. In January 1980, the won was devalued by 19.8 percent together with the adoption of a new floating exchange rate system. Interest rates were increased by 6 percentage points in January and readjusted down by 2.1% in September. Domestic energy prices were increased to reflect the oil price hike and the devaluation of the won.

There are several measures under consideration with a view to enhancing the competitiveness of the Korean economy. Relevant to our discussion here is the improvements in product quality, which in turn requires an intensive invest-

(2) Such a deterioration is attributable partly to a rise in crude oil price. The oil import bill was 2.2 billion dollars in 1978, 3.3 billion dollars in 1979 and is expected to exceed 6 billion dollars in 1980.
ment in research and development (R & D) sectors and manpower training. Technology can be acquired from two sources: internal and external. The development of modern science and technology is characterized by largescale R & D, concomitant large investment and the joint participation of scientists and engineers from various fields in the systematic undertaking of such projects. Since it is almost impossible for research organizations, academic institutions or private enterprises to undertake such projects individually, they must be carried out systematically on a national scale.

Introduction of foreign technology does play an important role in the course of industrialization of any nation. It does even more so in case of developing countries which is unable either to afford the capital requirements for investment in research and development sectors or to wait for the lengthy gestation period. Transfer of technology has been a major means of industrialization and its upgrading in Korean economy. In the following, a series of policies toward enhancing the level of technology and various legal measures to achieve the policy goals will be briefly treated. This naturally consists of two sets of problems: one on the measures to improve local technology and another on the legal system regarding the transfer of technology.

II. Strategy for Technology Development

Science and technology has been an important national planning instrument since the early sixties and, as a consequence, science and technology development plans were considered part of consecutive economic plans. The development of science and technology in a developing country requires as a prerequisite an efficient national science policy mechanism and a build-up of the institutional infrastructure for science.

The Ministry of Science and Technology (MOST) was established in 1967 to act as the focal point for planning, promoting and coordinating the nation’s scientific and technological activities. Until that time, the Bureau of Technology Management at the Economic Planning Board (EPB) was in charge of scientific and technological cooperation with other countries in general and technological
assistance from the United States in particular. Since then, MOST has been closely involved in the economic development planning process and formulated the longterm plan for the development of science and technology (1967~1986). The plan covers twenty years, and aptly recognizes the fact that if national economic goals for the eighties were to be reached, "Korea must telescope the one hundred years or so of the development of the advanced nations into twenty years for its own development."

The above mentioned plan places great emphasis on manpower development, technology development which includes importation of technology from advanced countries as well as improvement of domestic R & D capability, and creation of a favorable social milieu for science and technology development. As the following summary shows, the technology development plan clearly states the main goals of the development strategy in a sequential order:

A. 1960s

1) to strengthen scientific and technological education,
2) to build the scientific and technological infrastructure,
3) to promote the importation of foreign technology.

B. 1970s

1) to expand training in strategically important skills,
2) to improve the institutional mechanism for the adaptation of imported technology,
3) to promote research activities to be applied to industrial needs.

C. 1980s

1) to expand facilities for advanced scientific and engineering manpower,
2) to launch exportation of technology and engineering know-how,
3) to promote long-term advanced research and to strengthen development of systems research.

In order to implement the technology development plan, various laws have been enacted the typical features of which are shown below:

1) The Science and Technology Promotion Act\(^{(4)}\) of 1967 provides the basic commitment of the Government to support science and technology and to provide policy leadership.

2) The Technology Development Promotion Act\(^{(5)}\) of 1972 supports private and public corporate enterprises in their scientific and technological development efforts through tax privileges and other incentives.

3) The Engineering Services Promotion Act\(^{(6)}\) of 1973 provides for the strengthening of the capabilities of local engineering firms and for encouraging the use of them.

4) The National Technical Qualification Act\(^{(7)}\) of 1973 promotes the status of engineers and craftsmen and insures them proper recognition in society through a system of examinations and certifications.

5) The Special Research Institutes Assistance Act\(^{(8)}\) of 1973 provides incentives in legal and financial terms for research institutes in specialized fields of high priority such as shipbuilding, electronics, communication, mechanical engineering, and energy.

6) The Korea Science and Engineering Foundation Act\(^{(9)}\) of 1976 provides a legal basis for the establishment of a foundation to support basic research in pure and applied sciences, mostly at academic institutions.

### III. Policy on Self-Sufficiency in Technology

In view of the limited natural resources and relatively small size of market it was necessary for the Korean government to place heavy emphasis on developing export-oriented industries to achieve economic development. Accordingly,

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\(^{(4)}\) *Kwaehak Kisul Chinhungpop*, Law No. 1864, January 16, 1967 as amended by Law No. 2377, December 18, 1972


\(^{(9)}\) *Han'guk Kwaehak Chasdanpop*, Law No. 2943, December 22, 1976.
science policy was oriented toward developing industrial technology. The introduction of technology from advance countries has been the mainstay for the development of industrial technology especially at the early stage of economic growth.

The experience gained in Korea strongly suggests that the choice of appropriate technology can be properly made only when the technology importing country itself has the capability to make relevant decisions and to negotiate with the supplier. It further suggests that the adaptation and improvement of imported technology is only possible when a specific level of indigenous R & D capability exists. In other words, the transfer of technology and the development of local R & D capabilities are best pursued not sequentially but concurrently.

The total R & D investment for 1977 accounted for only 0.8 percent of the GNP, \(^{(10)}\) and of this the government to industry ratio was 70 percent to 30 percent. This well indicates the pattern of government oriented R & D investment. According to the government plan, R & D investment from private sectors is expected to rise sharply to reach the same level of public investment with an increase in total investment to 1.5 percent of GNP by 1981. \(^{(11)}\) Korean industry has so far lacked the capability to develop industrial technology on its own, so that it has naturally turned either to foreign services to fill technological needs or to domestic services provided by such government supported research organization as the Korea Institute of Science and Technology(KIST).

KIST was established in 1966 as an independent contract research organization to satisfy Korea’s industrial R & D needs. It is the central technical organization for the development of industrial technology and the window through which the transfer of foreign technology to domestic industry can be made.

KIST, the first modern multi-disciplinary research institute in Korea, had to

\(^{(10)}\) The year 1977 of Korea is often compared with the year 1967 of Japan when the export from each country exceeded 10 billion dollars on current basis. The amount of Japanese investments in R&D sectors in 1967 was equivalent to 1.67 percent of GNP and 2.1 percent of GNP in 1977.

cover a broad spectrum of activities in applied research including project feasibility studies, technical services for small and medium industries, and engineering studies on a pilot plant scale. It has acted as a medium of technological development on the basis of imported technology and as the center for the development of industrial technology within the country, but with the economy's ever increasing technological demands, KIST alone is no longer capable of meeting all of industry’s technical needs.

As a result, specialized research institutes to support strategic industries were set up. These institutes include:

— Atomic Energy Research Institute.
— Standards Research Institute.
— Shipbuilding Research Institute.
— Chemical Technology Research Institute.
— Energy Research Institute.
— Nuclear Fuel Development Institute.
— Heavy Electrical Equipment Testing Institute.
— Telecommunications Research Institute.
— Machinery and Metal Testing & Research Institute.
— Electronics Research Institute.
— Ocean Research and Development Institute.
— Regional Development Institute.
— Solar Energy Research Institute.
— Korea Scientific and Technological Information Center (KORSTIC).

To meet the fast growing technological needs of industry during the coming decade, expansion of sites for research institutions as well as improvement in the environment for R & D investments are strenuously being pursued by the government. For example, Daeduk Science Town is near completion which will serve as the center or research institutes for strategic industries. It comprises, on the area of 27.8 square kilometres, about thirty research institutes including the above-mentioned Standards Research Institute, Chemical Technology Research
Institute, Nuclear Fuel Development Institute and other privately owned research facilities. The town will have a population 50,000 consisted mostly of scientists, researchers and their families by 1981.

Recently, large firms have started to set up their own research facilities for technological self-support. It is beyond doubt that these facilities will also be useful for digestion, adaptation and improvement of imported technology. To encourage such a trend, Government has launched a matching effort to enhance industrial development by applying incentive schemes including low-interest long-term loans and tax credits for R&D investment under the Technology Development Promotion Act.\(^{(12)}\)

Under the Act, both exemption from taxes and preferential financial support are available to the corporations which allocate and use corporate funds for technology development. Such funds comprise the Technology Development Preparation Fund which is considered indirect financial support to industries because, with these funds, industries can sponsor research projects to solve their technological problems at the strategic industrial research institute established with government support. Industries can use these funds not only to finance the development of their own technologies but also to purchase research equipment and technological information and to train their technological manpower.\(^{(13)}\)

If a domestic corporation invests in the commercial application of the results of indigenous research and adaptation of imported technology, the same financial favor may be given. In addition, the Government may execute relevant measures, including a restriction on importation of identical or similar products when necessary to protect the results of domestic research.\(^{(14)}\) This measure is designed to protect the local producer of the new technology product. For example, Sunkyong Chemical Co. developed a process for manufacturing polyester film under a joint research program with the KIST by December 1977. When Cheil Textile Co. entered into a technology inducement contract with Toray of Japan

\(^{(12)}\) Arts. 6 and 7 of the Technology Development Promotion Act.
\(^{(13)}\) Art. 4-9 of the Tax Exemption Control Act.
\(^{(14)}\) Art. 8-2 of the Technology Development Promotion Act.
for the supply of know-how for producing polyester chip and base film, and filed the application for approval of the contract with the EPB in January 1978, two months prior to taking effect of Article 8-2 of the Technology Development Promotion Act, the approval was held for a period of five years on the ground that the approval of such contract may hamper the development of indigenous technology.

National technological development and progress require a strong engineering services resource. The lack of basic engineering services will, however, tend to result in excessive dependence on foreign firms for know-how, organization, and products and the retarding of build-up of practical experience and capabilities among local engineers. This unfavorable situation derives from a lack of experienced engineers and of engineering service management ability, which in turn influences the potential market to rely on foreign rather than domestic sources. Thus, it becomes difficult for any domestic engineering service enterprise to obtain contracts and experience on a competitive basis.

As a measure to remedy this situation, the Engineering Services Promotion Act was enacted in 1973 whereby engineering services which could be performed by domestic engineers were in principle given to Korean engineering groups. Even when a domestic engineering firm is unable to undertake a project on its own, it may become the prime contractor, when it is assisted in some degree by foreign engineering firms. The idea behind this is to give domestic firms opportunities to learn as much as possible about the mobilization of talent as well as project management.

The government has taken several steps to alleviate the acute shortage of high-level technical manpower for engineering firms. First of all, the government has put into effect a number of measures to recruit Korean scientists and engineers working abroad. Since its establishment in 1966, the KIST has brought back hundreds of them by providing housing and remuneration equivalent to the amount they would expect to get by working overseas and, as R & D are upgraded at other institutes and a number of new specialized research institutes
are established, active campaigns are underway to recruit more such scientists and engineers. (15)

In short, Korea has been successful in forestalling the brain drain, as increasingly high level scientists have returned from overseas to man industrial research organizations. In 1971 the government established a special two-year professional engineers’ course at the Korea Advanced Institute of Science (KAIS) (16) which is aimed at providing post graduate education for engineers and scientists and is contributing greatly to the development of technical manpower. The idea was that such an institution was needed to guide and stimulate the reorientation of graduate education and research in all Korean universities. The students of KAIS receive full scholarship and are entitled to exemption from military conscription which is quite an exceptional privilege in Korea.

Some Colleges of Engineering at the University level are designated to specialize in certain specific areas in the course of research and education. (17) The considerations behind the concept of specialized College of Engineering are to raise a cadre of high quality engineers to meet the increasing demand, to effectively promote the heavy-petrochemical industry and to successfully complete the Fourth Five-year Development Plan. The Colleges thus designated will

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(15) During the period from 1968 to June 1980, 530 scientists returned to Korea under the auspices of the Ministry of Science and Technology: among them, 265 on a permanent basis and 265 on a temporary basis less than two year contract. In addition, 749 scientists had come home to take posts in universities and numerous private research institutions by April 1979.

(16) The KAIS offers Master’s and Doctorate courses in twelve fields. It has produced over one thousand Masters and twenty-six Ph. D.s by February 1980. Students enrolled now are 919 about 60 percent of which come from Seoul National University which is the most prestigious institution for higher education in Korea.

(17) The list of Colleges of Engineering is as follows:

<table>
<thead>
<tr>
<th>University</th>
<th>Field</th>
<th>Number of Student admitted in 1980</th>
<th>Date designated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pusan Univ.</td>
<td>machinery</td>
<td>1,000</td>
<td>March 30, 1977</td>
</tr>
<tr>
<td>Kyongbuk Univ.</td>
<td>electronics</td>
<td>800</td>
<td>March 30, 1977</td>
</tr>
<tr>
<td>Chonnam Univ.</td>
<td>chemicals</td>
<td>600</td>
<td>March 30, 1977</td>
</tr>
<tr>
<td>Ch’ungnam Univ.</td>
<td>industrial education</td>
<td>900</td>
<td>March 30, 1977</td>
</tr>
<tr>
<td>Ch’ungbuk Univ.</td>
<td>civil and construction</td>
<td>500</td>
<td>September 26, 1979</td>
</tr>
<tr>
<td>Chonbuk Univ.</td>
<td>metal and precision machinery</td>
<td>600</td>
<td>September 26, 1979</td>
</tr>
</tbody>
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receive financial assistances for the expansion of research facilities from government, for the invitation of foreign scholars and overseas training of faculty members, and for research funds.

In addition, vocational school education and professional training are also being given strong support. Practising engineers have been encouraged to take advantage of international technical cooperation programs. The expenses incurred for training engineers and the cost of inviting foreign specialists have been treated as items eligible for tax deduction.

IV. Transfer of Technology

A. Background

From the early stage of adopting foreign capital policy, the implication of introducing advanced technology into industrial sectors was well understood by the Korean government. The Foreign Capital Inducement Promotion Act promulgated in January, 1960, the predecessor of the FCIA, contained one Article regarding the technology assistance contract, which covered the transfer of patent right, trademark right, design right, utility model right and industrial know-how. The FCIA established one Chapter covering technology inducement contract and does provide tax exemption to the licensors on their income generated from such contracts.

During the laying of the foundation for industrialization in early 1960s, the country was deficient in both capital and technology, and as a result, the import of technology was made in most cases as an integral part of new projects. Turnkey projects which cover the import of all necessary equipment, technology, and technological services in the construction of an industrial factory were the norm. In addition, foreign technology was imported in the form of direct foreign investment or joint venture.

In recent years, however, technology, as distinguished from capital, has become major subject-matter of international contracts or agreements in order to meet the rising demand for technology in the nation's socio-economic development. Because of the ambitiousness of our socio-economic goals, the quantum of tech-
nology required is huge and the quality so high that it would be unwise, if not impossible, to rely on indigenously generated technology alone. To encourage the inflow of foreign technology, the Korean government has been according some favorable fiscal incentives to the import of technology, in the form of tax holidays.(18)

B. Administrative Organization

All types of technology inducement contracts must obtain the authorization of the Minister of the Economic Planning Board in accordance with the provision of Article 19, Para. 1 of the FCIA. The EPB is an independent administrative arm of the Korean government headed by a Cabinet member. The basic functions of the EPB are establishment of overall development plans, development of the national economy, formulation and execution of the budget, overall coordination of plans for mobilization of resources available in and outside the country and for investment, and economic cooperation with international organizations in and outside the country.

There is only one Deputy Prime Minister within the Korean government who is to perform the work specifically requested by the Prime Minister and the Minister of the EPB is ex officio Deputy Prime Minister. In addition to assuming the responsibility of proper functioning of the EPB as its Minister, the Minister of the EPB supervises and coordinates the performance of other economic Ministries with a view to assuring the coherence and consistency in economic policies and insuring harmonious implementation thereof. He presides over various committees of meetings consisted of Ministers of economic Ministries. As a senior among them, he is responsible for the policymaking in economic affairs and his opinion is often prevalent, through his high office or personal persuasion, in the formulation of economic policies.

(18) Para. 2, Art. 21 of the FCIA: Income tax or corporation tax to be imposed on the remuneration paid to a licensor of technology under a technology inducement contract shall be exempted or reduced in accordance with the provisions of the following items:
1. Such taxes shall not be assessed for five years from the date on which authorization is obtained in accordance with the provision of Para. 1, Art. 19; and
2. For three years following the expiration of the period stated in the preceding item 1, fifty percent of the tax amount computed under the pertinent tax laws shall be reduced.
C. Industrial Property Law

Korea has four special laws that regulate the authorization of rights for patents, utility models, trade marks, and designs. To a large extent, the laws were similar to those found in Japan. However, a substantial portion of the laws were modified to meet the changing reality in Korean economic relations with other countries, the typical example being the principle of quasi-internationalism instead of territorial principle as a criterion of new invention. The Office of Patent Administration is responsible for the registration and nullification of these rights. The Civil District Court handles the legal cases such as those involving injunctions, infringements, and damage claims resulting from any violation of the laws. Persons not domiciled in Korea are required by law to submit their applications through a patent agent or attorney.

Foreigners and foreign juridical persons with an address of place of business in Korea can obtain patent rights, trademark rights and other industrial rights on the same terms as Koreans, but those without a Korean address or place of business can only obtain these rights when reciprocity is guaranteed by treaty, agreement, or law.

Korea is not a signatory to the Paris Union Convention for the Protection of Industrial Property, or to the Madrid Agreement for the international registration of trade marks. The Korean Government has signed bilateral treaties or agreements with the government of 40 countries as of January 1, 1979 for the mutual granting and protection of specific rights, which includes, among others, Canada, France, Germany, Italy, Japan, United Kingdom, and the United States. It is also significant to note that the Korean government has decided to join the Paris Union Convention for the Protection of Industrial Property as soon as possible. In line with such policy determination, government prepared legislative proposals for the purpose of revising the existing industrial property


laws in such a way as to incorporate the basic principles of the Paris Convention into our laws and sent to the National Assembly for consideration. It is, therefore, only a matter of time that Korea will become a signatory State to the Paris Convention.

D. Status of Technology Inducement

Transfer of technology took place as early as in 1962 in the form of technology inducement contract. However, the record of technology inducement contracts authorized by the EPB has not been quite impressive. During the ten-year period from 1962, only 301 contracts involving transfer of industrial property were authorized. During the Third Five-Year Development Period (1972 ~ 1976), 433 cases obtained the EPB approval. In recent years as the Korean economy grows and the firms face severe competition in world market, they began to realize the importance of improving the standard of industrial technology. For example, 130 contracts were authorized in 1976, 170 cases in 1977, 270 cases in 1978 and 261 cases in 1979. The total amount of royalty remitted by the end of 1978 reached 259.2 million dollars and the overall analysis of the impact such transfers of technology had so far on the Korean economy is yet to be done.

The need for advanced technology is clearly felt. The number of technology inducement contract is expected to rise very rapidly. To facilitate more speedy introduction of industrial property right, the government took steps toward gradually simplifying the administrative procedure for the introduction of foreign technology in 1978 and 1979. Under the provision of the FCIA, one who intends to introduce advanced technology under the condition of remitting royalty in foreign means of payment must obtain prior approval of the Minister of the Economic Planning Board. Opinions of various Ministries concerned were presented and deliberated by the Review Committee before rendering final decision. It normally takes about one to two months for any application to be approved.

According to the current regulation, any contract stipulating the royalty payment in one of the following modes is classified as Class A and is approved
by the Ministry concerned alone:

1) initial payment not exceeding 500 thousand dollars,
2) running royalty not exceeding 10 percent of the net sales,
3) lump sum not exceeding one million dollars.

In other words, the authority of the Minister of the EPB was delegated to the Minister of individual Ministry concerned, thus simplifying the entire procedure. Any contract stipulating the payment of royalty in a mode other than the aforementioned criteria or stipulating the introduction of technology for defense industry or atomic power is classified as Class B and is still subject to the approval of the Minister of the EPB and its procedure remains unchanged. This means that Korea has taken the first round of measures for the liberalization of technology transfer and is working toward broadening it gradually.

The government is in the process of evolving a coherent bank of policies and/or measures to deal efficiently and effectively with foreign technology inducement. As with capital inducement, the government hopes to see more diversification of technology supply sources so that the competitiveness of Korean industry, based on the comparative advantages of the special nature of the technology, can be strengthened. The so-called “depackaging policy” which means the separation of technology from ancillary technology is viewed as a reasonable solution to the future needs of foreign technology.

Technology search and referral services for private industry are to be greatly reinforced through such institutions as the Transfer of Technology Center (TTC) which is an annex to the KIST and KORSTIC. TTC was established in 1976 for the purpose of providing informations to medium and small enterprises. It runs a data bank and assists the medium and small enterprises in counseling on the importation of appropriate technology, negotiating the terms and conditions of contracts with the prospective licensor and performing feasibility study of the project under consideration. An effective post-inducement evaluation and management system is to be established to identify the problems involved in imported technology and to maximize spillover effects.
In addition, small and medium industries are to be given special support in importing foreign technology. The Small and Medium Enterprise Promotion Agency was established in 1978 to provide, in part, advisory services to small and medium size firms as to feasibility study, introduction of foreign technology and its application, and manpower training. Through the utilization of research institutes, the Agency may introduce foreign technology, adapt skills to local application and distribute them to those whoever wants to participate in the scheme.

V. CONCLUDING REMARKS

To meet the mounting needs for technology in our socio-economic development plan, which aims at broadening the linkage base between the Korean and the world economy, Korea cannot think only of inducing foreign technology for its one sided benefit, but rather it must seek mutual benefits to sustain equally productive relationships. It is of the utmost importance that we take an affirmative attitude toward international cooperation and collaboration, be it bilateral or multilateral in advancing the interdependency of the World.

For developed countries, relatively fast growing developing countries like Korea may serve as important and to some extent essential media for absorbing the technology which they possess and transmitting such technology to other developing countries. This may be accomplished with some modifications which might, if properly done, enhance the utility of such technology in meeting specific needs of the developing countries, needs which are not likely to be met by developed countries.

The transfer of technology "as is" fails to accomplish the cross-fertilization which takes place in the process of giving and receiving. It is in this area that Korea may be able to devote itself to the absorption of technology from its developers and then to the impartation thereof to others. Korean legal system

(21) Art. 32, item 2 of the Medium-Small Enterprise Promotion Act (chungso kiop chinhungpop) Law No. 3126, promulgated on December 5, 1978, as amended by Law No. 3240, on January 1, 1980.
governing the transfer of technology should be reviewed from this perspective and be revised in such a way as to facilitate smooth achievement of the goals stated above.