Science and Technology Policies of Korea.

– Past and Present

In Korea, science and technology policies have been molded to fit the socioeconomic needs of the times. In this sense, we can categorise Korea's science and technology policies into three consecutive stages ; the 1960's, 1970's and 1980's.

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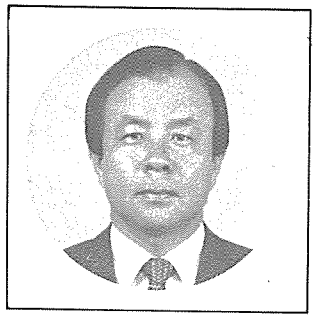

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In the first stage, which covered the 1960's, our industry was based on simple skilled labour, paving the way for the development of basic industries for import substitution as well as for the expansion of export-oriented light industries. In response to the need to meet such industrial demands, foreign technologies were induced for the first time under a license agreement.

However, local technological capability was so weak that most foreign technologies were imported as a packaged type embodied with capital goods rather than as patent rights.

In this early stage of industrialization, the Korean Government had to focus on promoting

the adoption of imported technology, while creating the science and technology infrastructure.

In this regard, there were two primary institutions worthwhile to mention here : the Ministry of Science and Technology, the central Government body designed to undertake Science and Technology development administration, and also the Korea Institute of Science and Technology, the first comprehensive and multidisciplinary industrial technology research institute.

The Second stage was the 1970's. The accumulation of technical experience throughout the 1960's provided a base for local industry to move on to the next stage of technical development, i. e., the assimilation of foreign technologies. In line with the Korean Government's aggressive policy to promote the development of the heavy and chemical industries, the demands for foreign technologies were drastically increased at this stage.

For the development of industrial technology geared towards the adaptation of foreign technology, a dozen other Government-supported research institutes specializing in the areas of machinery, electronics, chemistry, shipbuilding, and other related areas were established during this time.

The Government also drastically expanded college and graduate education in this period with special emphasis on the mechanical, chemical and electronic engineering fields. In particular, the Government established a new graduate school, the Korea Advanced Institute of Science, in 1970.

Since its inception, not only have great contributions been made in training leading scientists and engineers but also in stimulating the reorientation of scientific education and research in the Korean university system. Furthermore, a large number of Korean scientists have been repatriated from abroad, with financial support from the Government, subsequently playing a vital role in R&D activities at research institutes, colleges and industries.

The current decade presents the third stage.

The environment for technology development in the 1980's is undergoing a period of rapid change both at home and abroad, entirely different from that of the past two decades. Prior to 1980, it was relatively easy to import mature foreign technology at low cost. However, this has not been available in the 1980's.

As Korea's industrial structure has shifted from labor-intensive to technology intensive industries since the turn of the decade, industries require more sophisticated hightechnology than ever before. Importing advanced technology is no longer an easy task because of the current trend of protectionism and the tremendously high cost of technology transfer.

Such a changing industrial environment makes it imperative for Korea to develop self-reproducing technological capabilities domestically. Increased local R&D efforts have become necessary for Korean industries not only to improve imported technology, but also to implement their own novel ideas. At this stage research and development is critically important, stressing the localization of key strategic

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technology and promotion of industry's technological self-development.

Against this background, Korea's policy on science and technology development thus far in the 1980's has emphasized the following six main points :

First, the implementation of "Science & Technology-led Development Policy" ;

Second, the continued securing and nurtu ring of high caliber scientific and technological manpower ;

Third, the drastic increase of R & D investment and implementation of national R & D programs ;

Fourth, the establishment of a national R & D system to maximize the utilization of available resources ;

Fifth, the goal-oriented systemization of various policy means for stimulation of industrial technology innovation ;

Sixth, the promotion of internationalization of science and technology development, externally, and enlargement of regionalization, internally.

In line with these six aforementioned points allow me to explain in detail the policy directions the Korean Government has pursued.

First, we have aggressively pushed ahead with Science and Technology-led Development Policy since the beginning of the 1980's.

As is generally recognized, an indispensable factor in the furthering of science and technology in a developing country is that the political leader must have clear recognition of the vital role of science and technology in national development, and a strong will and support for implementing necessary policies. In this regard, Korea is a case in point.

The President of the Republic of Korea chairs the Science and Technology Promotion Meeting with representation from relevant circles of society including the administrative, legislative, business, and academia.

The main function of this quarterly Meeting is to coordinate and formulate technology development policy on the national level, report on advanced technology trends, and to introduce successful cases of technology development in both the private and public sectors.

These meetings provide guidance and nation wide support for the advancement of science and technology in the 1980's. As a result, science and technology factors have been given primary consideration, not only in forming socio-economic development policies but also in allocating resources, thus invigorating R & D activities.

Second, the Government has placed special emphasis on the securing and nurturing of cadres of creative scientists and high calibre technological manpower in order to meet the rapidly increasing demand for R & D, both in the public and private sectors.

As of 1986, the total number of qualified scientists and engineers stood at 52,000, representing 13 persons per 10,000 population, showing that Korea is still short of high-caliber manpower. To alleviate this shortage, the Government, together with the private sector, will pursue the realization of effective training in science and technology-related fields in high education.

In accordance with the long-term forecasting of high-level scientific and technological manpower requirements, we will secure a total of 150,000 scientists and engineers, or 30 persons

per 10,000 population, by the year 2001.

Among them, 15,000, or 10%, will be tapped as the top level scientists capable of carrying out the leading role in their respective R. D. & E, fields. To this end, the Korean Government will reinforce higher science and engineering education, expand overseas training programs for advanced study, and also enlarge repatriation of Korean scientists and engineers abroad.

Third, the Government has drastically increased R & D investment, recording remarkable achievements since 1980. The budget for science and technology has been increased by about 15% annually over the past six years, while public enterprises, including telecommunications and electrical power companies, are encouraged to set aside a sizable portion of their income for technology development.

Along with this, the private sector has also rapidly augmented their R & D investment by about 60% annually, helped in large part by various government incentive programs. As a result, the total amount of R & D expenditures jumped from $577 million in 1981, or 0.9% of GNP, to $1.8 billion in 1986, or 2% of GNP.

However, we will require more extensive funding if we are to upgrade our science and technology to the level of other advanced countries by the turn of the century. Therefore, we have set the goal of boosting R & D investment to 3% of GNP in 1991, and to over 5% in the year 2001. The Korean Government is determined to achieve this target.

In this regard, I would like to mention that the Government has undertaken national R & D projects since 1982, which normally could not be pursued by industry alone, to develop key industrial technology for our industrialization. The criteria for selecting national projects include their technology intensiveness, international comparative advantage, conservation of energy and resources, growth potential and contribution to social development.

Among the projects of this nature, industry-oriented projects have been carried out via the joint efforts of industry, public institutes, and the Government, while those projects of public interest, such as energy and resources development and health and environment related areas, have been undertaken by the public sector itself.

In connection with the trend of the ever-increasing R & D scale and sophistication, the Government is responding in a systematic way by upscaling national R & D projects with increased investment.

Fifth, in order to foster the industrial technology development, the Korean Government provides various incentives to private enterprise, which must play the leading role in the process of industrial technology development in a free market economy.

In the case of proprietary technology, the Government makes available indirect incentives to the private sector under the principle of competition. Meanwhile, as for generic technology, the Government extends direct as well as indirect support for the private and public sectors under the principle of cooperation.

Following these two basic principles, the Government recommends large scale companies to establish at least one research center per company, while small and medium companies are encouraged to organize research & devel-

opment consortiums in related fields. For this various incentives are provided through tax exemptions, special depreciation, financial grants, availability of long-term low interest development loans, and Government procurement, among others.

As a result of such an incentive system, we have witnessed a remarkable increase in the number of private research institutes from 52 in 1980 to 350 in 1987, and of research consortiums from none in 1980 to 32 in 1987.

In the future, we will continue to make the incentive system more effective and systemitized, giving special priority to small and medium industries. We expectthis will accelerate R & D activities of the private sector, responding to the rapidly growing demands.

Sixth, Korea has strengthened international technical cooperation in order to meet the rising tide of internationalization of technology development.

Externally, to better cope with the growing interdependence of the world economy, Korea has been expanding both bilateral and multilateral international cooperation activities, especially since 1980.

Up to the present, the Korean Government has exchanged scientific and technical cooperation agreements with 59 countries and holds Science Minister Meetings with 10 countries annually.

Furthermore, 49 international joint research projects have been in full swing with financial support from the Government amounting to $4 million this year.

In the spirit of mutual benefit and complement, the Government will make continuous efforts for the exchange of researchers, technical information, joint R & D programs and active participation in international cooperative programs.

In addition, we sincerely desire to expand technical assistance to developing countries to share our experiences and technologies for our common prosperity.

Until 1983, Korea had been a recipient country in terms of training. However, since then, we have reversed that trend to become a donor country. Out of our sense of responsibility, we have been operating programs providing technical training and dispatching experts to developing countries, with the scope of the programs having been expanded each year.

Seventh, domestically, the regional dispersion of technology development is regarded as one of our major policy directions.

The Government has established industrial complexes in major regions of the country since the 1970's, while actively promoting the construction of Daeduk Science Town, along with new technology-based industries in the vicinity.

The initial construction of Daeduk Science Town, with an area of 28 km, has already been completed. Eight Government funded research institutes and three private institutes, as well as one university, have already moved into the town.

Other Government funded and private research institutes are also encouraged to move to Daeduk in order to enjoy economic efficiency and to promote the common use of research facilities, personnel and information.

By 1991, the Town will become the major research park in Korea, housing more than forty institutes, and accomodating a population

of about 50,000. The Government also plans to construct other specialized research parks in the major industrial areas throughout Korea, forming a network with Daeduk Science Town as the core.

Eighth, a climate favorable to the development of science and technology has been a major policy goal for laying a solid foundation for science and technology.

As such, the Government, with the cooperation of the academic and industrial communities and the mass media, has launched a nation-wide science movement whose main objectives are to create an environment in which the general public can apply scientific principles to daily living and to instill the exploratory affitude of youth in science with a spirit of rationality, efficiency and creativeness.

To realize the ideas and goals of the movement, several kinds of activities have been taken advantage of, including the operation of exhibition halls and film libraries, publication of booklets, lectures to housewives and students, and invention contests, to name but a few.

The Government also plans to launch a science movement in a new dimension designed to enhance the ability of the people to adapt to a modern industrialized society, thereby providing a strong foundation for national development.

New Challenges for the Year 2000.

Even though Korea has achieved considerable progress to date in science and technology, our technological capability in terms of R & D spending, manpower and infrastructure is far behind that of the level of advanced countries. The technology contribution to overall economic growth yet remains at less than 10%, which is very low when compared with that of advanced countries. Improving this situation is a new challenge we look forward to overcoming.

For the future, the Korean Government has set an ambitious goal of becoming a scientifically and technologically advanced country by the end of the next decade. For realization of this goal, the Ministry of Science and Technology has prepared a "Long-range Plan of Science and Technology Toward the Year 2000".

With our limited available resources, Korea realizes the difficulty in competing against advanced countries in every field simultaneously.

Therefore, we will select our comparative advantage areas, based on certain criteria, and push ahead intensively in these areas with all our capability.

Based on this premise, we have categorized science and technology areas into the following five groups :

The first group includes those areas which are economically feasible from a short-term viewpoint, such as informatics, fine chemicals and precision machinery.

The next group encompasses areas where the possibility of medium-term success is high, including bio-technology and new materials.

Public benefit areas such as the environment, health and welfare constitute the third group while.

The fourth group is made up of ocean-ography and aeronautics, where the future prospects are promising in the medium-and long

-term.

The common group, the last group, from the prospect of the short-, medium and long-term, is comprised of basic science and engineering, providing the basis for development in all sectors of science and technology.

For effective implementation of these five groups, we will pursue the following strategies.

The first one is the Strategy for "Specialization" by which technology development will be specialized in specific fields with the limited available resources Korea has for R & D.

The next is the Strategy for "Cooperation"in the development of technology the systemizing of R & D capability by constructing a cooperative research system among industry, academia and research institutes.

Third, the Strategy for "Internationalization" of R & D will be pursued in order to overcome the limitations of domestic R & D capabilities.

This is followed by the for Strategy "Localization", the formation of a research and development network across major regions of the country. And finaliy, we should push ahead with Strategy for "Autonomy", by which the private sector will enjoy a free hand in benefitting from the market mechanism.

By applying these strategies in harmony and balance, we hope to accelerate the nation's science and technology innovation in order to realize our target of joining the ranks of advanced countries by the turn of the century.

Conclusion

As we are well aware, the basic road to advancement of scientific technology is the creation of a national consensus for a science-oriented society by attaching great significance to public awareness of science and technology.

Therefore, the major task that lies ahead is to expedite the creation of a conducive atmosphere for science and technology development.

As the science and technology system is an integral part of the national development system, on the whole, elements of science and technology development should be introduced to all fields of society, - economics, undustry, finance, trade, diplomacy, national defense, education, construction, transportation, communications and social welfare, so that a totally united system can be established.

In order to accomplish the national development target of the advancement of the technology level, the Korean Government will continuously forge ahead with science and technology-led policies by integrating all related policy measures in a total approach.

Even though Korea has achieved considerable progress to date in science and technology, our technological capability in terms of R & D spending, manpower and infrastructure is far behind that of the level of advanced countries. The technology contribution to overall economic growth yet remains at less than 10%, which is very low when compared with that of advanced countries. Improving this situation is a new challenge we look forward to overcoming.