Korea's S&T Policy English Translation Project: Series 1

The 40-Year History of Science and Technology

Chapter 4. Technology-driven Policy of the 1980s

Over the past half century, Korea has achieved remarkable economic growth. Among the major factors that have driven this growth, the development and innovation of science and technology is said to have made greatest contribution. For this reason, developing countries have shown growing interest in learning more about Korea's policy during the early phase of its economic growth.

Science and Technology Policy Institute (STEPI) aims to assist developing countries in their efforts to establish science and technology policy by translating policy materials related to Korea's past development of science and technology. For the first series of this project, we have translated some sections (1960s to 1980s) of The 40-Year History of Science and Technology, published by the Ministry of Science and Technology in 2008.

Ministry of Science, ICT and Future Planning

STEPI SCIENCE AND TECHNOLOGY POLICY INSTITUTE

Chapter 4. Technology-driven Policy of the 1980s

Section 1. Establishment of Technology-oriented Domestic and International Environment

1. Changes in Domestic Environment for Industrial Development

From the 1960s, the Korean economy has achieved a high level of economic growth, driven by the promotion of economic development plans and the export-led development strategy. In particular, between 1973 and 1979, the Korean government aggressively promoted a heavy and chemical industrialization policy, led by six strategic industries—steel, chemicals, nonferrous metals, machinery, shipbuilding, and electronics. The technology necessary to develop such strategic industries was introduced primarily through the assistance of advanced countries; and by adopting and improving such technologies, Korea was able to build the foundation for its growth as a technology-intensive industrial country.

However, the heavy and chemical industrialization policy began to struggle due to the excessive and overlapping investments in certain areas, and the monopolistic and oligopolistic structure of several large corporations restricted the country's sustainable economic development. In addition, while focusing on fostering an assembly system oriented toward mass production while promoting export-led industrialization, there arose a structural problem of simultaneous increases in both exports and imports. Amid this situation, the second oil crisis in 1979 hit Korea's economy hard. As the crisis pushed advanced countries into economic recession, those countries began switching to protectionist policies, which in turn slowed Korea's sluggish exports even more. As a result, Korea's economy was impacted by three major stressors: namely, the trade deficit, increase in foreign debt, and inflation. This led Korea to record negative growth for the first time since it began promoting economic development in the 1980s.

Under these circumstances, the Korean government started fiercely promoting an economic stabilization policy in the 1980s. While strengthening its economy by switching the country's economic management to a private sector-led system and improving economic efficiency, the government sought to prevent foreign trade friction through an aggressive open-door policy. At the same time, it tried to balance investment in order to resolve the issue of the excessive and redundant investments that resulted from the heavy and chemical industrialization policy, and promoted the rationalization of low-productivity industries. With the help of such economic stabilization policies, Korea was able to achieve an annual inflation rate of five percent from 1982, which gradually pushed the national economy back into a growth phase.

Moreover, in 1985, with the so-called "Three Blessings Phenomenon"—the combination of the depreciation of the U.S. dollar, decline in international interest rates, and decrease in the oil price—Korea had a golden opportunity for rapid growth. The decrease in international interest rates and the oil price reduced Korea's burdens of foreign debt and production cost, while the depreciation of the U.S. dollar significantly improved the price competitiveness of Korea's export goods. Driven by these three factors, Korea's economy was able to achieve incredible economic growth of 12.1 percent CAGR between 1986 and 1988.

In the late 1980s, the Korean economy faced difficulties yet again. As the nation's demand for democracy erupted following 1987, the rapid political change and conflict between labor and management continued. In particular, as labor unions became increasingly active, the nation's previously suppressed wages shot up, leading to a rapid weakening of the price competitiveness of Koran products. At the same time, real estate prices and logistics costs increased, causing the vulnerability of social overhead capital to become a major problem.

Thus, the 1980s were a time of great economic change and uncertainty for Korea, driven by a number of domestic and international variables. In particular, Korea had lost its competitiveness, and its economy could no longer depend on cheap labor as it had in the past. Therefore, the demand for economic advancement and reorganization of the industrial structure grew, and in terms of science and technology policy, calls were made for a new approach that reflected the circumstances of the time.

2. Competition in the Development of Advanced Technology and Strengthening of Protectionism

The main characteristic of the external environment surrounding science and technology in the 1980s was the rapid development of advanced technology led by industrialized countries. While seeking to make a transition to a new development strategy as a means of escaping the prolonged recession, major industrialized countries, including the United States, invested a massive amount of capital and personnel. Signs of change first began to appear in the areas of information technology, such as semiconductors and computers; new materials technology, such as fine ceramics and functional polymers; and life sciences, such as treatments for incurable diseases; as well as in the development of new product categories. These advanced technologies were expected to have decisive impacts on countries' competitiveness by creating new industries and triggering a wave of technology innovation.

With the rise of such advanced technologies, the governments of industrialized countries began actively intervening in technology development, departing from their relatively hands-off approach of the past. In the 1970s, for example, the United States adhered to a non-intervention policy, allowing the R&D activities of private companies to unfold according to the principle of market competition. However, in the early 1980s, when the nation faced enormous trade and finance deficits, the United States embarked on a policy of strengthening support for private technology development in order to enhance its international competitiveness. The United States systematically promoted the expansion of its tax-reduction scheme for R&D investment, exclusion of antitrust laws for joint research between corporations, and strengthening of government support for technology innovation among small- and medium-sized corporations by enacting the Technology Transfer Promotion Act, Joint Research Support Act, Small Corporation Technology Innovation Support Act, and other such legislation. In Japan, private corporations pursued the development of advanced technologies based on close cooperation between private corporations and strong government support, such as the establishment of the VLSI Technology Research Association in the late 1970s to promote the development of highly integrated semiconductors. In line with the shifts underway in the United States and Japan, the European Community also actively pursued the development of advanced technology by setting up joint research projects among member countries, including the European Strategic Program for Research and Development in Information Technology (ESPRIT), Research and Development in Advanced Communication Technologies for Europe (RACE), Basic Research in Industrial Technology for Europe (BRITE), and Research and Development for Genetic Engineering (BRIDGE).

This intense competition among industrialized countries to develop advanced technology led to the strengthening of technology protectionism. In particular, the scientific and technological superiority of the United States, once considered unshakeable, was challenged by Japan and Germany in the 1980s, resulting in further strengthening of protectionism. Moreover, in the late 1980s, when newly developed countries began engaging in increased technology development, the international competition over technology development deepened and became increasingly complex. Thus, while taking active steps to prevent their advanced technologies from leaking to competing countries, industrialized countries, including the United States, prepared safeguards to protect their new intellectual property, including software and material patents, and strengthened measures to protect their industries and technology through trade negotiations.

Under these circumstances, due to the difficulty of obtaining information on technology development and even greater difficulty of introducing advanced technologies, the transition to a technology-intensive industrial structure by actively developing advanced technologies, which was a global trend at the time, emerged as a major issue in Korea; and to realize such a transition, the government needed to implement more aggressive measures and strategies. In other words, with the emergence of advanced technologies and related protectionist measures of industrialized countries, the 1980s was a time when significant change in science and technology policy was urgently required in order to ensure and maintain Korea's national competitiveness through the independent development of science and technology.

Section 2. Basis for systemic technology-driven policy

1. Basis of Technology-driven Policy

In order to achieve sustainable and stable national development while actively responding to these domestic and international changes, it was of utmost importance for Korea to achieve global competitiveness in terms of science and technology development. In the early 1980s, discussions on how science and technology could contribute to overcoming the challenges faced by the nation were expanded, and the recognition that international competitiveness in science and technology should be the nation's main objective spread to various sectors, including the government. This recognition emphasized the development of the national economy based on technology rather than exports, which led to a transition from export-driven to technology-driven policy. Going one step beyond supporting economic development, technology-driven policy was implemented in order to play an active role in leading economic and social development by raising Korea's technological capability to a level on par with that of industrialized countries by maximizing the investment of available resources with the strong support of the nation's highest levels of leadership. The basis of science and technology policy in the 1980s, represented by technology-driven policy, is summarized in the paragraph below.

First, science and technology policy was implemented in the 1980s with the strong support of the nation's highest levels of leadership. In 1982, under the direct chairmanship of the president, the enlarged meeting for technology promotion began to be held by the government on a regular basis, in which politicians of the ruling and opposition parties, Cabinet members, leaders of conglomerates, and representatives of the academic and research communities all participated together. This enabled the government to emphasize the national importance of science and technology and establish a system for developing and implementing policy alternatives for the promotion of science and technology development. Thus, science and technology became a major issue for numerous ministries besides the Ministry of Science and Technology. Although science and technology policy had previously been the sole responsibility of the Ministry of Science and Technology, in the 1980s, it became an issue under the Ministry of Commerce and Industry, Ministry of Communications, Ministry of Health and Social Affairs, and Ministry of Environment as well. In addition, in order to systematically promote science and technology policy from a long-term perspective, a long-term science and technology development plan for the period leading up to the 2000s (1987-2001) was established in 1986.

Second, the national R&D system was reorganized in order to promote technology-driven policy effectively. Although government-funded research institutes had led most of Korea's R&D projects in the 1970s, private corporations began establishing research institutes, one after another, in the 1980s, with the aim of achieving substantial technology development. Around 1990, universities also began actively fostering research organizations. In particular, with the goal of maximizing the effectiveness of R&D investment and the efficiency of national research organizations, 16 government-funded science and technology research institutes were merged in 1980 to form nine institutes. At the same time, while consistently promoting the construction of the Daedeok Research Complex, the government sought to strengthen collaboration among industries, universities, and institutes through various means, such as the nationwide establishment of science and industrial research complexes.

Third, a national R&D project was launched to aggressively develop core strategic technologies. In the 1980s, such development of core strategic technologies was promoted by developing advanced technologies capable of leading industries in the future and promoting the advancement of industrial technology. The national R&D project that was initiated through specific R&D projects in 1982 can be regarded as representative of this policy change. Up until the 1970s, science and technology policy had merely served to indirectly satisfy the demands for technology arising in the process of developing strategic industries. However, from the 1980s, the government began directly managing such policy through national R&D projects in an effort to facilitate the development of core technologies. On the other hand, the basis of industrial policy was changed from the existing industry-fostering policy to a functional support policy with the enactment of the Industrial Development Act in 1986.

Fourth, the basis for the training of advanced science and technology personnel at the national level was established in the 1980s. As significant emphasis had been placed on the importance of excellent human resources in the successful development of science and technology, the policy for fostering high-caliber personnel in science and technology was greatly strengthened. In order to achieve this, the expansion and improvement of domestic science and engineering universities and graduate schools were actively promoted, and a system for rapidly fostering skilled science and technology personnel was established through the Korea Advanced Institute of Science and Technology, Korea Institute of Technology, and Korea's science high schools. In addition, a project to attract outstanding foreign scientists and support for dispatching domestic personnel overseas to receive training and expertise was developed, along with various support systems to assist industries in training technicians and securing researchers.

Finally, the policy basis under which private corporations became the main drivers of technological development began to take root in the 1980s. As a result, highly motivated private corporations came to account for more than 70 percent of the nation's total R&D investment, with the aggressive technology support system of the government playing an important role in this change. Especially, the government assisted private corporations in setting up their own technology development organizations by aggressively encouraging the establishment of corporation-affiliated research institutes and industrial research associations. Furthermore, the government promoted the technology development efforts of private corporations by substantially strengthening the support program for technology development, which encompassed taxes, finance, human resources, and demand creation, and permitted the use of national R&D funds, which had been paid mainly to government-funded research institutes, to support private corporations.

2. Technology Promotion as a presidential agenda

Established in 1982, the enlarged meeting for technology promotion was one of the key vehicles for supporting and implementing the technology-driven policies of the 1980s. Under the direct chairmanship of the South Korean president, this meeting was participated by around 200 people, including politicians of the ruling and opposition parties, representatives of economic, academic, and research communities, and Cabinet members. Despite the absence of a legal basis, the meeting was held regularly based on the strong commitment of President Chun Doo-hwan.

During the six-year period from 1982 to 1987, the enlarged meeting for technology promotion was held a total of 12 times, addressing a total of 27 policy issues. At the meetings, technology development success stories were reported, and excellent researchers were granted awards. As it was held at the highest levels of government, the meeting provided all government departments with opportunities to expand their interests and participation in science and technology and made a significant contribution to stimulating the technology development activities of corporations. In 1984, the Technology Promotion Council was established as a policy consultative body tasked with providing practical support for the enlarged meeting for technology promotion. Following the inauguration of the Sixth Republic of South Korea, however, the meeting was stopped, and later replaced by the science and technology promotion meeting from 1989 to 1991.

The enlarged meeting for technology promotion was held three times annually in 1982 and 1983, twice annually in 1984 and 1985, and once annually in 1986 and 1987. At the first meeting in 1982, reports were given on the emergence of the new technology-led era and status of and plans for the technology development efforts of corporations, followed by reports on the promotion measures for technology innovation by corporations and strategic industrialization of the fine chemicals industry at the second meeting and reports on the international strategy for technology advancement and promotion plan for science and technology education at the third meeting. At the first meeting in 1983, participants discussed issues concerning the status and challenges of technology-driven policy and the beginning of the information age, followed by discussions on the rise of new technology-intensive industries, collection and use of information on industrial technology from overseas, and development of major mineral resources at the second meeting and discussions on investment plans for new technologies, plans for the improvement of the government purchasing program, and implementation policy for communication technology promotion at the third meeting. In 1984, the technology development trends of major industries and plan for the expansion of the mutual authentication system were reported at the first meeting, while the trends of and countermeasures for recent technology development, operation of a government purchasing program focused on quality, effectiveness, and efficiency, and selection of cases of advanced technology development were discussed at the second meeting that year. In the two meetings held in 1985, the topics discussed at the first meeting were the promotion of technology-intensive small- and medium-sized corporations, direction of the promotion of national R&D projects in the period leading up to the 2000s, and improvement of international payments through technology development, while at the second meeting, the issues addressed were the long-term plans for science and technology development leading up to the 2000s and status of technology-intensive, small- and medium-sized corporations. At the first meeting in 1986, the action plans related to the long-term plan for science and technology development leading up to the 2000s was discussed thoroughly, and at the first meeting in 1987, reports were given on fostering science and determining the direction of technology innovation activities of private companies.

As a body created to support the enlarged meeting for technology promotion, the Technology Promotion Council was chaired by the minister of science and technology and participated by the vice-ministers of related ministries and professionals from industries, universities, and research institutes, who served as council members. While consulting and mediating on policy issues related to technology innovation, the Technology Promotion Council also reviewed report items of the enlarged meeting for technology promotion and examined the implementation status of each. Between 1984 and 1987, the council was convened 15 times, making significant contributions to the creation of a cooperative environment for the development of science and technology among related departments. In addition, regional technology promotion councils were held, albeit intermittently, to engage in front-line promotions of the policies and systems proposed by the enlarged meeting for technology promotion and Technology Promotion Council in the relevant regions.

3. Establishment of Mid- and Long-term Science and Technology Development Plans

Since 1962, Korea has regularly implemented its Five-year Economic Development Plan, and between 1982 and 1996, the plan was called the Five-year Economic and Social Development Plan. In the 1980s, the government implemented the Fifth Five-year Economic and Social Development Plan: Science and Technology Sector Plan (1982-1986) and Sixth Five-year Economic and Social Development Plan: Science and Technology Sector Plan (1987-1991). While both emphasizing technology-driven policy, these two plans also addressed the necessity of actively responding to the changes in the technological environment and raising Korea's science and technology capabilities to the level of developed countries.

In addition, in 1986, the Ministry of Science and Technology established a long-term science and technology development plan for the period leading up to the 2000s (1987-2001), aiming to systematically promote science and technology policy from a long-term perspective. This plan was developed based on the recognition that Korea needed a long-term master plan for science and technology, spanning a period of 15 years, in order to join the ranks of developed countries in the late 20th century. In particular, this plan consolidated the technology-driven policy advocated by the government of the Fifth Republic of South Korea and emphasized science and technology as a key element of all national policies.

The basic goal of this long-term science and technology development plan was to have Korea ranked among the world's 10 most technologically advanced countries and realize an advanced society by the 2000s. In particular, the plan sought to realize Korea's supremacy in specific areas, including semiconductors, telecommunications, fine chemicals, and machinery and automation technology. Under this plan, the government supported the Korea's growth, leading it to become the world's 15th largest country in terms of GNP and 10th largest in terms of trade, and met the social and economic needs of the nation.

The long-term science and technology development plan for the period leading up to the 2000s set six requirements that had to be met when choosing areas of concentration: high ratio of investment to growth, significant ripple effects in technology and other industries, crucial to economic stability, high potential for success in consideration of the technical capability required, direct impact on public welfare, and contribution to the future development of the nation. Based on these requirements, information technology, materials technology, key industrial technology, energy and resources technology, public welfare technology, large-scale convergence technology, and basic research were selected as key areas requiring promotion. In particular, after selecting the areas with the greatest chances of success and developing 229 projects to be the subjects of strategic promotion, the plan emphasized the efficient allocation of science and technology resources on short-, mid-, and long-term bases, in accordance with the established priority.

Also, it has thoroughly addressed the issue of the allocation of science and technology resources through the efficient management of science and technology personnel and investment. In particular, with the goal of increasing the number of science and technology personnel from 37,000 in 1984 to 150,000 in 2001, the plan emphasized training and securing key research personnel, quality improvement of science and engineering universities, and optimization of the use of science and technology personnel. In terms of science and technology investment, the plan aimed to raise investment from 1.44 percent of the GNP in 1984 to more than 3.1 percent of the GNP by 2001 and proposed a plan to increase the proportion of the government budget for science and technology from 2.8 percent in 1985 to more than five percent by 2001.

While focusing on all aspects of technology innovation and the means of promoting technology innovation in general, the long-term science and technology development plan emphasized the consistent improvement and strengthening of science and technology policy. The plan placed particular importance on improving and strengthening the technology development support policy in order to vitalize the R&D efforts of private corporations and addressed issues related to taxes and support policies related to funding for technology development, market and demand creation for new technology products, and promotion of technology-intensive, small- and medium-sized enterprises. In addition, while seeking to build a foundation for science and technology development, the plan focused on the establishment of a system for the distribution and utilization of science and technology information, regional implementation of technology development, creation of science and technology complexes, international development of science and technology and foreign cooperation, improvement of science and technology education, and creation of an environment conducive to science and technology development.

Section 3. Reorganization and Restructuring of National R&D System

1. Merger of Government-funded Research Institutes

Up until the 1970s, Korea's science and technology policy had been symbolized mainly through government-funded research institutes. In 1966, the Korea Institute of Science and Technology (KIST), Korea's first government-funded research institute, was established. Later, following the enactment of the Support of Specific Research Institutes Act in 1973, independent research institutes in various professional fields were established one after another, based on the research labs of KIST. The number of government-funded science and technology research institutes increased sharply in the mid-1970s, reaching a total of 19, including one affiliated institute, by August 1980. These institutes were established under numerous different ministries, including: seven institutes under the Ministry of Science and Technology (Korea Institute of Science and Technology, KIST-affiliated Korea Ocean Research and Development Institute, Korea Advanced Institute of Science, Korea Science and Technology Information Center, Korea Science and Engineering Foundation, Korea Atomic Energy Research Institute, and Korea Nuclear Fuel Development Institute), four under the Ministry of Commerce and Industry (Korea Test Institute of Machinery and Metals, Korea Research Institute of Ships, Korea Institute of Electronics Technology, and Korea Research Institute of Chemical Technology), three under the Ministry of Energy and Resources (Korea Energy Research Institute, Korea Research Institute of Geoscience and Mineral Resources, and Korea Electric Research and Testing Institute), two under the Monopoly Bureau (Korea Ginseng Research Institute and Korea Tobacco Research Institute), and one each under the Ministry of Defense (Agency for Defense Development), Ministry of Communication (Korea Telecommunications Research Institute), and Industrial Advancement Administration (Korea Standards Research Institute).

The Special Committee for National Security Measures (SCNSM), which was established in May 1980, ahead of the inauguration of the Fifth Republic of South Korea, set out to reform various fields, including politics, economy, and society, and focused particularly on merging government-funded research institutes. At that time, the Economy Subcommittee of the Special Committee for National Security Measures identified and reported on the problems of government-funded science and technology research institutes. Its findings are as follows. First, the excessive number of research institutes, compared to the number of research personnel and facilities and total amount of investment, prohibited individual institutes from reaching an appropriate scale, which resulted in low investment efficiency. Second, as the number of research institutes increased, each one needed to increase its number of administrative personnel accordingly, which hampered research capabilities and caused negative effects due to the transfer of personnel from research to administrative positions. Third, as various types of research institutes were established, their functions and research areas began to overlap and excessive competition developed among them over commissioned research projects and funding. Fourth, as research institutes were scattered among various departments and did not cooperate with one another, sharing facilities and exchanging research personnel and information were unnecessarily difficult, leading to a nationwide decrease in research efficiency and difficulties in utilizing research results. Fifth, due to the lack of comprehensive mediation and management of R&D projects, including research project selection, investment distribution, and evaluation and use of research results, at the national level, it was very difficult to make efficient investments in research. The report concluded that, in order to resolve these problems and maximize the efficiency of R&D investment and research effectiveness, government-funded science and technology research institutes needed to be merged.

Based on the plans for R&D system reorganization and management improvement prepared by the Ministry of Science and Technology, the government began taking steps to merge government-funded research institutes in November 1980. The main goals of this plan were: to have the Ministry of Science and Technology take charge of all government-funded science and technology research institutes, merge individual research institutes into appropriately sized institutes so as to achieve efficient management and operation, and transfer testing, inspection, and licensing duties to related organizations, such as the Korea Testing Laboratory. According to this plan, 16 government-funded research institutes, except for the Agency for Defense Development, Korea Science and Technology Information Center, and Korea Science and Engineering Foundation, were merged to form nine institutes, which were then put under the direct control of the Ministry of Science and Technology. Specifically, the Korea Institute of Science and Technology, KIST-affiliated Korea Ocean Research and Development Institute, and Korea Advanced Institute of Science were merged to create the Korea Advanced Institute of Science and Technology; the Korea Energy Research Institute and Korea Research Institute of Geoscience and Mineral Resources were combined to form the Korea Institute of Energy and Resources; the Korea Test Institute of Machinery and Metals and Korea Research Institute of Ships were joined to create the Korea Center for Machinery and Materials; the Korea Electric Research and Testing Institute and Korea Telecommunications Research Institute formed the Korea Electrotechnology and Telecommunications Research Institute; and the Korea Ginseng Research Institute and Korea Tobacco Research Institute combined to establish the Korea Ginseng and Tobacco Research Institute.

2. Changes to Government-funded Research Institutes in the 1980s

From 1981, the Ministry of Science and Technology, which was responsible for the comprehensive management of government-funded research institutes, promoted various policies aimed at increasing the efficiency of research and development, including the establishment of mid- and long-term R&D plans for government-funded research institutes, rationalized management through the computerization of research work and integrated operation of overlapping administrative support services, operation of a flexible research-project-oriented organization, creation of an incentive program to promote better treatment of researchers, performance improvement through a benefit program, and fostering of a positive research atmosphere through the provision of annual research leaves and development of awards programs. In particular, the Ministry of Science and Technology had government-funded research institutes lead specific R&D projects in order to stabilize the provision of research expenses, which served as a crucial catalyst for vitalizing the research activities of government-funded research institutes.

In the 1980s, there was significant controversy over the merging of government-funded research institutes. Especially, the merger of the Korea Institute of Science and Technology and Korea Advanced Institute of Science to form the Korea Advanced Institute of Science and Technology caused considerable conflict. The government's main reason for merging a research institute and an educational institute, each with different characteristics, was to increase the operational effectiveness and efficiencies of the two institutes by complementing their capabilities through cooperation between the areas of education and research. However, despite the government's justification for such education-research cooperation, the operation and personnel management of the Korea Advanced Institute of Science and Technology was handled mainly by former members of the Korea Advanced Institute of Science, which drew complaints from the former members of the Korea Institute of Science and Technology. Ultimately, the merger of the two institutes ended in failure, with the Korea Institute of Science and Technology separating from the newly formed institute in 1989 to become an independent body once again, as it was prior to 1980. The reasons behind this failure were that the merger had been carried out without any discussion or understanding with or among the members involved as well as the stark differences in the organizational cultures of the two institutes.

On the other hand, in response to the rise of new advanced technology sectors and diversification of national R&D projects in the mid-1980s, several government-funded research institutes were established or reorganized, and the ministries in charge were changed. In March 1985, the Korea Institute of Electronics Technology and the Korea Electrotechnology and Telecommunications Research Institute were merged to create the Electronics and Telecommunications Research Institute; in addition, the Korea Food Research Institute, under the jurisdiction of the Ministry of Agriculture and Fisheries, and the Korea Institute of Civil Engineering and Building Technology, under the jurisdiction of the Ministry of Construction, were established in December 1987 and January 1988, respectively. In June 1989, the Korea Institute of Science and Technology was separated from the Korea Advanced Institute of Science and Technology to become an independent institute. In October of the same year, the Korea Institute of Industrial Technology was established under the jurisdiction of the Ministry of Commerce and Industry, and in December of that year, the name of the Korea Advanced Energy Research Institute was changed back to the Korea Atomic Energy Research Institute. In June 1987, the Nuclear Safety Center was established as an institute affiliated with the Korea Atomic Energy Research Institute. In February 1990, this institute became an independent institute, known as the Korea Institute of Nuclear Safety. In addition, the Center for Science and Technology Policy was established as an institute affiliated with the Korea Advanced Institute of Science and Technology in January 1987; the Korea Basic Science Center, an institute affiliated with the Korea Science and Engineering Foundation in August 1988; and the Korea Aerospace Research Institute, an institute affiliated with the Korea Center for Machinery and Materials in November 1989.

Although the number of government-funded research institutes expanded again after the mid-1980s, their relative share of national R&D activities had decreased. The share of R&D expenses of non-profit organizations composed mainly of government-funded research institutes reached 25.4 percent in 1970 and 26.8 percent in 1980. However, that decreased to 20.0 percent in 1985 and 14.8 percent in 1990. Meanwhile, the share of researchers increased from 8.8 percent in 1970 to 13.1 percent in 1980, before entering a gradual decline to 11.3 percent in 1985 and 10.6 percent in 1990. This phenomenon was the result of the increase in R&D activities of private corporations and universities after the 1980s rather than the reduced role of government-funded research institutes.

3. Development of Corporate and University Research Organizations

With the help of the technology-driven policy aggressively promoted by the government, the number of corporation-affiliated research institutes exploded in the 1980s. With the enactment of the Technology Development Promotion Act in 1981 and its enforcement decree and enforcement regulations in 1982, corporation-affiliated research institutes were able to participate as leaders of national R&D projects. In addition, the government introduced preferential benefits, including military service exemptions for researchers, special tax exemptions for research samples, local property tax exemptions for research institutes with 30 or more researchers, and tariff reductions on goods for research purposes. With the revision of the Enforcement Decree of the Technology Development Promotion Act in 1985, the requirements for the establishment of research institutes were changed to encourage the participation of small- and medium-sized corporations in the establishment of research institutes. Before the revision, the minimum requirement for the establishment of a research institute was to have a staff of at least 10 researchers with bachelors of science degrees and independent research facilities and equipment; however, from 1986, small- and medium-sized corporations were required to have only five such researchers.

With such government actions, there was a boom in the establishment of corporation-affiliated research institutes in the 1980s. In 1981, there were only 53 corporation-affiliated research institutes, but that number increased to 183 in 1985 and further to 604 in 1988, surpassing 1,000 by April 1991. Moreover, the number of researchers at corporation-affiliated research institutes jumped from 2,086 in 1981 to 31,186 in 1990, while the ratio of the investment in R&D to the sales of corporations with affiliated research institutes rose from 0.97 percent in 1982 to 2.08 percent in 1990. Some corporations even went so far as to establish their own research complexes or independent research institutes, such as the Lucky Goldstar Research Complex in 1984 and Samsung Advanced Institute of Technology in 1987. With this growing trend in the establishment of corporation-affiliated research institutes, the reporting and management responsibilities concerning corporation-affiliated research institutes administered by the Ministry of Science and Technology were transferred to the Korea Industrial Technology Association in February 1991.

Industrial technology research associations began to be established along with corporation-affiliated research institutes in the 1980s. These industrial technology research associations were established as a means of enhancing research efficiency through the study of complex and advanced technologies, together with the sharing of the personnel, funds, and facilities of members. In January 1982, the Korea Film Condenser Research Association, Korea's first industrial technology research association, was established, and the government announced its intention to support the establishment and operation of more such research associations at the first enlarged meeting for technology promotion. The government then went on to prepare support programs for industrial technology research associations, including corporate and income tax deductions equivalent to 10 percent of the technology development expenses consigned by the associations and permission to use members' dues as technology development reserves. This led to the enactment of the Industrial Technology Research Association Promotion Act in May 1986. Backed by this act, the number of industrial technology research associations increased dramatically from only 11 associations (56 members) in 1982 to 35 associations (480 members) in 1987, and further to 54 associations (1,181 members) in 1990.

In the 1980s, the government also began strengthening its support for the research activities of universities. Although the Ministry of Culture and Education was already maintaining a fund for this purpose, composed mainly of academic research funds and the research funds of the Korea Science and Engineering Foundation, it was far from enough to stimulate the research activities of universities. However, with the launch of various national R&D projects after the 1980s, more efforts were made to find ways of supporting fundamental research; accordingly, the research funds of universities increased enormously. In particular, the Ministry of Science and Technology began supporting objective basic research expenses as part of a specific R&D project in 1982, which played an important role in vitalizing the research activities of universities thereafter. Financial support for the basic science research activities of universities was only KRW 28.9 billion during the three-year period from 1983 to 1986; however, that support was increased to KRW 33 billion in 1988, and further to KRW 49.3 billion in 1990. As of 1990, the total number of university-affiliated research institutes amounted to 375, including 137 institutes at national universities, 210 institutes at private universities, and 28 institutes at technical colleges. As these figures show, although universities had begun establishing research organizations in the 1980s, the scale of support and extent of their research results remained insufficient. With the enactment of the Researches of Basic Sciences Promotion Act in 1989 and implementation of the Excellent Research Center Support Project, university-affiliated research institutes were finally able to become major players in national science and technology innovation.

4. Full-scale Development and Expansion of Research Complexes

In the 1980s, efforts were made to strengthen cooperation among industries, universities, and research institutes through the establishment of research complexes and fostering of R&D leaders at government-funded research institutes, corporations, and universities. A major example was Daedeok Science Cluster. The project to establish Daedeok Science Cluster was launched in 1973; however, due to the repeated changes that were made to the plan, the project remained at a standstill throughout the 1970s. In the 1980s, the establishment of Daedeok Science Cluster finally began in earnest. In accordance with the Industrial Base Development Promotion Act, passed in August 1981, the Ministry of Construction established and announced the basic plan for the development of an industrial base in Daedeok, and in April 1984, the direction for the effective construction of Daedeok Science Cluster was determined at the first technology promotion council. Later, at the 14th Economic Ministerial Meeting, held in August 1984, the site preparation method was changed from a private-development to a public-development method, and with the designation of the Korea Land Development Corporation as the developer of the project in May 1985, the development of Daedeok Science Cluster truly got underway.

The Korea Land Development Corporation began the first phase of the project in November 1985, and the second phase in May 1987. During the process of promoting the Daedeok Science Cluster project, a regulatory system for land transactions, the first of its kind in Korea, was implemented, and the basic plans for the project were changed several times in order to make improvements to the research and educational facilities. In particular, as the whole area of Daedeok Science Cluster had been selected as the site of the 1993 Expo in February 1989, an increase in the scale of the complex had to be considered. In November 1990, the revised plan increased the resident organizations of the complex from 50 to 60, expanded the population from 50,000 to 70,000, and extended the development period from between 1981 and 1990 to between 1981 and 1993.

The Daedeok Science Cluster project was accelerated with the first Science and Technology Promotion Meeting held in July 1990. At the meeting, President Roh Tae-woo expressed his wish that the Daedeok Science Cluster project be completed earlier than planned, within three years, and launched the early establishment committee for Daedeok Science Cluster, with the minister of science and technology as its chairman and vice-ministers of related ministries as its members. Upon the creation of this committee, national support for the construction of Daedeok Science Cluster was significantly strengthened, leading to the completion of the first phase of the project in March 1991, and the second phase in November 1992. The completion ceremony for the complex was held on November 27, 1992. By that time, a total of 33 organizations had already finished moving in, including three government organizations, 15 government-funded research institutes, four government-invested organizations, eight private research institutes, and three higher education institutes.

With the establishment of Daedeok Science Cluster, the government then began promoting the establishment of other science and industrial research complexes in major areas throughout Korea with the aim of supporting advanced technology research and the expansion of knowledge industries nationwide. The long-term plan for science and technology development leading up to the 2000s was established in 1986 based on the proposed idea of a nationwide network of science and technology "towns," and a study on the promotion plan for a nationwide technology belt was conducted in 1989. In the case of the Gwangju High-tech Industrial Research Cluster, the government led the project from 1990 through to the feasibility study that was conducted in 1988 and the establishment of the basic plan in 1989. Following this, efforts were made to promote the establishment plan for science and industrial research complexes in Busan, Daegu, Jeonju, and Gangneung. These complexes were planned to be led by local governments with the support of the central government.

Section 4. Launch and Expansion of National R&D Project

1. Development of Specific R&D Project

The Specific R&D Project was the first national R&D project in Korea that the government directly supported, by providing a large budget for research expenses, with the aim of promoting science and technology development and industrial technology advancement. In relation to this, the science and technology plan under the fifth Five-year Economic and Social Development Plan, established in 1981, proposed the systematic promotion of national R&D projects as a means of naturalizing core strategic technologies. The Specific R&D Project was introduced in 1982, after the Ministry of Science and Technology had secured a budget of KRW 13.3 billion in accordance with the Technology Development Promotion Act. Considering the fact that the budget of the Ministry of Science and Technology at the time was increased based only on the ministry's budget performance in each preceding year, the fact that the ministry was able to secure such a large portion of the national budget for the Specific R&D Project was a major accomplishment.

The Specific R&D Project was continually improved and expanded in response to the national and social demand for science and technology and the changes in the domestic and international technology development environments. In 1982, the first year of the project's implementation, two major projects were launched—the Government-led R&D Project and the Corporate-led R&D Project. The Government-led R&D Project focused on technologies that carried high risk but benefited great public interest, such as future-oriented advanced technology and public technology, and all of its research expenses were paid by the government. On the other hand, the Corporate-led R&D Project was concerned with core industrial technologies whose development was better not left to the free market, and was promoted through joint investment by the government and corporations. In 1983, the second year of the project's implementation, the Objective Basic Research Project was added as a means of utilizing the huge research potential of universities and building a foundation for technology innovation. In 1984, an initiative to privatize new technology projects was launched to promote the privatization of R&D results; this initiative was later reorganized to form the Small- and Medium-sized Enterprise R&D Support Project in 1985, with the aim of increasing the technological capabilities of small- and medium-sized enterprises. In 1986, the International Joint Research Project was established in response to the necessity of globalizing R&D, and an R&D evaluation project was implemented in order to enhance the efficiency of research management.

After the establishment of an annual implementation plan, the Specific R&D Project was announced through the press media and project applications were received. Upon the selection and confirmation of the projects through a review process, the Ministry of Science and Technology signed research agreements with the leading research institutes. In the past, each research institute had to secure research funds on its own, and select and carry out research projects independently. However, under the Specific R&D Project, research projects were first determined according to technology demand and then granted to research institutes to carry out, which stimulated competition among R&D institutes and promoted goal-oriented R&D. In the 1980s, the R&D coordinator of the Ministry of Science and Technology was responsible for the management of the Specific R&D Project. The Ministry of Science and Technology managed all aspects of the Specific R&D Project, including planning, selection, evaluation, and follow-up management, and took advantage of the expert committee of the Overall Science and Technology Review Council to secure the expertise needed to successfully carry out these tasks.

During the 10-year period from 1982 to 1991, a total of KRW 964.2 billion, composed of KRW 573.0 billion from the government and KRW 391.2 billion from private organizations, was invested in the Specific R&D Project, and a total of 5,415 individual projects were carried out. In terms of individual sectors' shares of the total investment, the core industrial technology sector accounted for 64.0 percent, the public technology sector for 18.4 percent, and the basic science research and research planning and evaluation sectors for a combined 17.5 percent. Among the industrial and public sectors, information technology, including semiconductors and computers, received the largest share of the investment, followed by mechanical technology, fine chemicals, chemical process technology, and energy and resources technology. However, new materials technology and life science technology received relatively small investments.

Over a 10-year period, the Specific R&D Project achieved remarkable results, with 231 projects having been privatized and 286 in the process of privatization. In the case of industrial property rights, a total of 1,211 applications (903 in Korea and 308 overseas) were submitted, and a total of 390 of those applications (310 in Korea and 80 overseas) were registered. In addition, a total of 9,456 research papers (5,050 in Korea and 4,406 overseas) were published in academic journals, and a total of 2,634 papers (2,053 in Korea and 581 overseas) were presented at academic conferences.

Besides these tangible accomplishments, the Specific R&D Project played a leading and meaningful role in advancing the nation's R&D system. The project secured a wide range of material and human resources at the national level to support R&D projects and significantly enhanced Korea's R&D capabilities in collaboration with corporations, universities, and government-funded research institutes. In addition, the Specific R&D Project served as a role model for other national R&D projects in Korea and had a major influence on the promotion and management system of R&D projects in other countries as well.

2. Promotion of Industrial Fundamental Technology Development Project

In the beginning of the 1980s, with the increase in the interrelationship between industrial development and technology innovation, the Ministry of Commerce and Industry began to recognize the importance of technology innovation as a policy, which resulted in the realization of industrial technology policies. In the 1980s, the ministry started fundraising efforts to promote various technologies. The Machinery Industry Promotion Fund (1980), Textile Industry Modernization Fund (1980), Electronics Industry Promotion Fund (1980), and the Technology Development Fund for quality improvement within the National Investment Fund (1983) and Small- and Medium-sized Enterprise Technology Development Fund (1984) were the major funds established as a result of such efforts. In addition, in the early 1980s, in order to promote the introduction of advanced technologies required for the technology innovation of private corporations, several attempts were made at liberalization, and the approval system was changed to a report system.

With the enactment of the Industrial Development Act in 1986, industrial technology policies became more regularized. Along with its abolishment of seven support laws for individual industries—including the Machinery Industry Promotion Act, Shipbuilding Industry Promotion Act, Electronics Industry Promotion Act, Steel Industry Fostering Act, Petrochemical Industry Fostering Act, Non-ferrous Metals Smelting Business Act, and Textile Industry Modernization Promotion Act—the government enacted the Industrial Development Act with the aim of enhancing functional support policies, including policies for technology development, human resource development, and the locations of corporations. However, some criticized that the existing industrial support policies failed to satisfy industries' technology demand, which was necessary for the advancement of the nation's industrial structure. With the enactment of the Industrial Development Act, the Ministry of Commerce and Industry also implemented various technology development support policies. One notable example was the Industrial Fundamental Technology Development Project, implemented in 1987.

The Industrial Fundamental Technology Development Project has been a driving force of Korea's national R&D projects, along with the Specific R&D Project. It targeted the major "bottleneck" technologies that industries urgently needed to achieve development as well as technologies that were difficult for private corporations to develop on their own. While the Specific R&D Project of the Ministry of Science and Technology was based on the "technology-push" model, the Industrial Fundamental Technology Development Project of the Ministry of Commerce and Industry was carried out in accordance with the "demand-pull" model. This demand-pull model also served as a rational base upon which the Ministry of Communication, Ministry of Construction and Transportation, and Ministry of Health and Welfare promoted the national R&D projects around the mid-1990s.

In 1987, the first year of its implementation, the Industrial Fundamental Technology Development project started with the Public-Private Joint Research Project, the Small and Medium-Sized Enterprise R&D Support project, and the R&D Evaluation and Management Project. In 1990, the Public-Private Joint Research Project was divided into common bottleneck technologies and advanced technologies, and in 1991, was expanded to encompass the Development Project for Common Bottleneck Technologies and Key Technologies, Advanced Industrial Technology Development Project, Small and Medium-Sized Enterprise R&D Support Project, International Joint Technology Development Project, and Technology Development Planning and Evaluation Project.

With a focus on satisfying the technical needs of the industrial community, the Industrial Fundamental Technology Development Project selected projects through demand surveys based on continuous government support and corporate participation. In order to ensure the systematic management of the project, the Ministry of Commerce and Industry established an expert committee for the project, which was composed of experts from industries, universities, and institutes. In addition, there were 36 subcommittees and 27 R&D planning groups. The subcommittees were in charge of the selection, management, and evaluation of projects, while the R&D planning groups were responsible for conducting the industrial technology demand surveys and engaging in consultations regarding the mid- and long-term direction of technology development.

Between 1987 and 1990, a total of KRW 256.8 billion, including KRW 102.6 billion from the government and KRW 154.2 billion from private organizations, was invested in the Industrial Fundamental Technology

Development Project, and a total of 621 projects were carried out as a result. Regarding individual sector's shares of the investment, common bottleneck technologies accounted for an overwhelming 76.1 percent, followed by advanced technologies with 16.7 percent, small- and medium-sized enterprise R&D support with 6.5 percent, and international support and planning and evaluation with 0.7 percent combined. In the case of common bottleneck technologies, 49.4 percent of the total research funds were paid to the Industrial Technology Research Association, and 21.3 percent and 24.9 percent to government-funded research institutes and universities, respectively.

Of the 624 projects completed by 1993 under the Industrial Fundamental Technology Development Project, 555 projects succeeded and 69 failed, giving the project a success rate of 88.9 percent. Of the 339 projects that reported the commercialization status of the technology they developed, 200 projects, accounting for 59.0 percent, successfully achieved commercialization.

3. Development of Energy and Information Technology

In addition to the Specific R&D Project and Industrial Fundamental Technology Development Project, the Ministry of Commerce and Industry promoted the Alternative Energy Technology Development Project as a national R&D project in the 1980s. This project was launched with the enactment of the Alternative Energy Technology Development Promotion Act in December 1987 and the establishment of the Basic Plan for Alternative Energy Technology Development in June 1988. With the goal of conducting basic research in order to commercialize alternative energy technologies, promote the domestic commercialization of economical alternative energy technologies, and increase alternative energy's share of the national energy supply to around three percent by 2001, the Alternative Energy Technology Development Project targeted 10 industries—solar thermal, solar power, bio-energy, waste, coal utilization technology, small hydro power, wind power, hydrogen energy, fuel cells, and ocean energy.

In the 1980s, information technology R&D, which had achieved the most remarkable growth among all advanced technologies, became regularized. In the beginning, information technology development was led by the Ministry of Science and Technology; however, from 1986, the responsibilities were spread across three ministries: namely, the Ministry of Science and Technology for software, the Ministry of Commerce and Industry for hardware, and the Ministry of Communication for information and communications. The major R&D project carried out in the 1980s included semiconductor technology development, such as the development of 4M DRAM, as well as the development of an administrative host network for the computerization of public organizations and development of a fully electronic switching system, from TDX-1 to TDX-10.

R&D for achieving global competitiveness in atomic energy technology was actively pursued in the 1980s. The Nuclear Fuel Localization Project, initiated with the establishment of the atomic energy localization plan in 1981, was selected as a project under the Specific R&D Project in 1982, and became regularized. Subsequently, the plan for self-sufficiency in nuclear power plant technology was established in 1983. At the same time, the Nuclear Power Plant Standardization Project was launched; this program consisted of three phases: basic research, design improvement research, and basic design implementation. As a response to the growing concerns over nuclear safety following the Chernobyl nuclear accident in 1986, the Nuclear Safety Center was established as an affiliate of the Atomic Energy Research Institute in 1987 and tasked with developing safety regulatory standards and conducting research on the safety of nuclear power plant operation.

In the 1980s, the government also promoted the 1988 Seoul Olympics Support Project and the Machinery, Parts, and Materials Localization Project as national R&D projects. In particular, the comprehensive computerized system for the Olympic Games and the doping test system were developed under the 1988 Seoul Olympics Support Project. With the establishment of the five-year localization plan in 1986, aiming to reduce Korea's dependency on Japan for machinery, parts, and materials, the Ministry of Commerce and Industry promoted joint development led by government-funded research institutes and small- and medium-sized enterprises with particular focus on sectors with high privatization potential.

Section 5. Strengthening Foundation for Human Resources Advanced Science and Technology

1. Establishment of Science and Technology Personnel Training System

In the 1980s, a training system for science and technology personnel was established through the Korea Advanced Institute of Science and Technology, Korea Institute of Technology, and Korea's science high schools. Founded in 1973 with 106 students studying in a master's program spanning six departments, the Korea Advanced Institute of Science quickly expanded its master's program to 374 students in three majors and 10 departments and launched a doctoral program with 87 students. The institute later merged with the Korea Institute of Science and Technology to form the Korea Advanced Institute of Science and Technology, which became the central education and research institute in Korea. After its establishment, the Korea Advanced Institute of Science and Technology began focusing more on developing its doctoral program and providing degrees for researchers working in industries or research institutes, as well as university professors, by establishing courses specifically designed for researchers in addition to its general courses. In June 1989, the graduate program of the Korea Advanced Institute of Science and Technology was separated from the institute to form the Korea Institute of Science and Technology, an independent organization, and in July of the same year, the bachelor's program was merged with the Korea Institute of Technology, where it continued to exist as the Korea Advanced Institute of Science and Technology.

The Korea Advanced Institute of Science and Technology had better conditions compared to other universities, with a total study body of 2,581, including 1,155 students in the doctor's and master's programs and 1,426 students in the bachelor's program, spanning 14 departments and one major, as well as 166 professors, as of 1989. In particular, having relocated to Daedeok Science Town in April 1990, the Korea Advanced Institute of Science and Technology was able to provide graduate and undergraduate programs at the same campus. From 1975 to 1990, the institute produced 5,843 master's graduates and 904 doctoral graduates, who have gone on to play a pivotal role in the nation's science and technology and industrial circles.

In 1986, the Korea Institute of Technology was established to educate creative personnel in science and technology capable of leading the future advancement of Korea's industrial society. The institute adopted a non-grade and non-major system that enabled students to graduate upon earning the necessary credits and guaranteed substantial support, including tuition exemptions, free dormitory lodging, scholarships, and opportunities to study abroad. In addition, the institute maintained a student-to-professor ratio of 10:1 and provided high-quality education based on the latest equipment and facilities. Until 1987, admission was limited to students of science high schools and graduates of general high schools; however, in 1988, the institute began accepting students who had completed two years or more of science or general high schools in order to discover scientifically gifted students early.

When it was first established in 1986, the Korea Institute of Technology had 540 students in four departments and 16 majors. By 1989, however, the institute's student body had grown to 1,982. In the same year, the institute was included in the program of the Korea Advanced Institute of Science and Technology, allowing the former to attain the status of a university. Starting with 23 graduates in August of 1989, the Korea Institute of Technology produced 795 graduates by 1991, most of whom were early graduates who had entered the master's program of the Korea Advanced Institute of Science and Technology.

As science education institutions for gifted students, Korea's science high schools began with the establishment of the Gyeonggi Science High School in March 1983. Additional science high schools were later established in Daejeon, Jeonnam, and Gyeongnam; as of 1993, 13 science high schools were in operation in 12 cities and provinces nationwide. These science high schools selected middle school students who had ranked in the top three percent in their second year or first semester of their third year and shown an aptitude for science. They also limited their class sizes to 30 students. In addition, science high schools provided all of their students with dormitory lodging at cost and offered a systematic, intensive, and science-oriented curriculum that allowed students to graduate earlier than students of general high schools. Of the 3,151 students that were enrolled in science high schools during the period from 1983 to 1992, 2,202 of them entered the bachelor's program of the Korea Advanced Institute of Science and Technology. In addition, 1,861 students (85 percent) who entered the bachelor's program were early graduates, proving that the focus on education for scientifically gifted students was producing tangible results.

2. Strengthening of Graduate Schools in Natural Sciences and Engineering

Up until the 1970s, Korea's higher education policy was focused on undergraduate education, and paid little attention to graduate education. Entering the 1980s, however, the government began promoting various policies in order to strengthen graduate school education in the natural sciences and engineering in an effort to keep pace with the changing trend in workforce demand structure. In particular, the government made efforts to secure excellent teachers, improve educational facilities and equipment, and support basic research by providing financing and educational loans; it also implemented policies to expand military service exemptions and provide scholarships for graduate students in natural sciences and engineering.

Through these policies, graduate school education in natural sciences and engineering showed significant quantitative growth in the 1980s. In 1983, there were 3,505 master's students in natural sciences and engineering, and that figure increased to 4,635 in 1985 and 5,903 in 1990. Regarding doctoral students in natural sciences and engineering, there were 293 in 1983, increasing to 538 in 1985 and 886 in 1990. In terms of quality, industrial and academic cooperation, which was limited to the Korea Advanced Institute of Science in the 1970s, expanded to include general universities, and the numbers of papers published in professional academic journals overseas and in Korea increased.

However, this achievement was only the beginning of the growth and development of natural sciences and engineering education and research at universities. From a legal perspective, the professor securement rate increased slightly from 60.4 percent in 1980 to 68.9 percent in 1990, while the number of students per professor showed little change, rising only marginally from 34.8 students in 1980 to 35.4 students in 1990. The number of books read per student increased hardly at all, from 17.3 books in 1980 to 18.0 books in 1990. In addition, the number of lectures per week still fell significantly short of that of advanced countries, and proper facilities and equipment for graduate school education and research had not yet been acquired.

The government made efforts to resolve these deficiencies in the 1980s, but ultimately failed to improve the environment for graduate school education and research in natural sciences and engineering.

3. Strengthening of International Exchange of Science and Technology Personnel

In the 1980s, with the growing emphasis on the importance of advanced technologies, international exchanges of science and technology personnel expanded significantly. Notable examples of this expansion were the projects to attract foreign scientists and promote postdoctoral studies overseas.

The project to attract foreign scientists was launched in 1968 to facilitate the adoption of advanced technologies and supplement the limited number of domestic personnel by attracting and leveraging a large number of the Korean scientists and technicians who were working overseas at the time. With a focus on scientists who had received doctoral degrees from foreign universities and gained two years or more of work experience in related fields, the project was divided into two areas—one where scientists made long-term commitments to work for at least two years in Korea, and the other, where they made short-term commitments to lecture or provide consultation services. With the vitalization of domestic and overseas R&D activities in the 1980s, the project to attract foreign scientists expanded further, and the Korea Science and Engineering Foundation took charge of the project in 1982. In addition, private corporations began attracting foreign scientists on their own in order to develop advanced technologies.

During the period from 1968 to 1980, the project attracted only 553 scientists; however, that number increased substantially to 1,290 during the period from 1981 to 1990. From 1968 to 1980, a total of 276 long-term commitments and 277 short-term commitments were made, while from 1981 to 1990, 775 long-term and 515 short-term commitments were made, showing a notable increase in the proportion of long-term commitments. Of the scientist who made long-term commitments, 382 went to work at research institutes, 345 went to universities, and 48 found positions in industries or associations. Of those who made short-term commitments, 247 went to work at research institutes, 87 went to universities, and 181 to industries. While universities preferred long-term commitments and industries preferred short-term commitments, research institutes accepted both without any noticeable preference.

In 1981, the Ministry of Science and Technology started promoting overseas training programs, including academic, postdoctoral, and technical training courses, as a means of effectively acquiring the advanced scientific knowledge and industrial technology that Korea direly needed at the time. In 1982, the Korea Science and Engineering Foundation took charge of the overseas training project, and handled only the overseas doctoral training courses from 1984. The purpose of the overseas doctoral training project was to accelerate Korea's accumulation of the latest science and technology information and R&D experience from developed countries and establish relationships with foreign scientists and technicians by dispatching new doctorate degree holders in natural sciences and engineering to universities and research institutes of advanced countries. Scientists eligible to participate in the project were those under 40 years old who had received a doctoral degree within the preceding five years, and the training period was set at a maximum of two years. A total of 1,144 people received support under the overseas doctoral training program during the period from 1982 to 1990. From 1982 to 1988, around 100 people received support annually, and that number increased to around 200 annually from 1989.

Section 6. Strengthening of Technology Development Efforts of Private Corporations

1. Substantial Increase of Investment in Science and Technology

R&D investment in Korea increased moderately in the 1960s and early 1970s, but accelerated from the late 1970s and increased rapidly from 1980. Specifically, R&D investment stood at KRW 211.7 billion in 1980, after which it increased to KRW 1.2371 trillion in 1985 and KRW 3.3499 trillion in 1990, showing an annual growth rate of 30 percent throughout the 1980s.

This remarkable increase in R&D investment was led by the private sector. Although the proportion of private R&D investment had been only 36.1 percent of the total investment in 1980, it grew to 50.0 percent by 1982, 75.2 percent by 1985, and 78.7 percent by 1988, reaching as high as 80.6 percent in 1990. In 1982, the proportion of R&D investment by the private sector began to exceed that of the government; from that time forward, R&D investment by the private sector accounted for around 70 percent of the total investment. In addition, the ratio of R&D investment to the sales of corporations increased gradually to 0.47 percent in the computer industry and 0.50 percent in the manufacturing industry by 1980, rising further to 1.23 percent and 1.51 percent in 1985 and 1.72 percent and 1.96 percent in 1990, respectively.

Such rapid expansion of private-sector investment in R&D in the 1980s was made possible through the changes in the R&D environment and government support. In terms of the changes in the environment, as Korea's labor-intensive economic structure began transitioning to a technology-intensive structure in the 1980s, the demand for technology development increased, and with the growing concern over the protectionist measures being implemented by advanced countries, Korean corporations, which depended on the adoption and application of foreign technologies, realized that they needed to undertake technology development efforts on their own. In terms of government support, while the technology-driven policy, which was promoted aggressively by the government, spread to corporations, the government provided greater opportunities to engage in technology development by offering various support programs.

Meanwhile, from the mid-1980s, the government began seeking out various systematic measures for expanding R&D investment. In particular, it increased the proportion of the budget for science and technology from around three percent to five percent, putting it on par with that of advanced countries. The government also designated part of its large scale investment and loan projects and the defense budget for R&D investment, and put more weight on technology development when evaluating the performance of government-invested organizations. The promotion of a special accounting system for science and technology development, establishment of the national technology promotion fund, implementation of a technology lottery, and introduction of a special purpose tax for science and technology development were also discussed. Although most of these measures remained only as proposals in the 1980s, some of them have been realized in the 1990s.

2. Expansion of Technology Development Support Programs

The government's aggressive support programs for technology development played an important role in expanding the private-sector-led investment in science and technology. In fact, it would not be an exaggeration to say that most of Korea's support programs for technology development today were organized in the 1980s, including the tax support system, financial support system, government purchase program, and military service exemptions for researchers.

The tax support system for technology development was established in the wake of the full-scale tax reform that was carried out in 1981. Although the government's tax reform leaned toward reducing tax benefits at the time, it was the opposite in the case of technology development. In 1981, regardless of the technology development reserve fund, the tax deduction system for technology and manpower development was introduced, as well as local property tax exemptions for new corporate research institutes, temporary special consumption tax rates for leading technology goods, and income tax exemptions for foreign technicians. In 1982, in order to strengthen support for the technology development efforts of private research institutes, tariff exemptions on goods intended for R&D purposes and special tax exemptions for research samples were added.

Since then, the tax support system for technology development has been complemented and enhanced to increase its effectiveness, and the range of use of the technology development reserves has been expanded and the procedure simplified. In addition, the tax deductions for technology and manpower development and tariff exemptions on goods for R&D purposes were expanded, and tax deductions on investment in research facilities were implemented. In particular, upon the expiration of the tax reduction system and revision of the tax system in 1986, Korea's technology development support tax system was significantly enhanced through the substantial expansion of the permitted sizes of technology development reserves and introduction of the allowance system for tax deductions and the carrying forward of such tax deductions on additional investment in technology and manpower development. In 1988, tax deductions for technology development reserves and investment in technology and manpower development were excluded from the total limits of tax support. Regarding investment in research facilities and the privatization of new technology, either tax deduction or special amortization was allowed.

The financial support for technology development was made available through financial institutions, venture capitalists, government financing, and government R&D projects. In terms of financial institutions, the Korea Development Bank introduced—for the first time—a technology development fund in the form of a long-term loan in 1976, and since 1978, the Industrial Bank of Korea has been handling a new technology privatization fund to support the technology development efforts of small- and medium-sized enterprises. In the 1980s, the Industrial Bank of Korea starting extending loans to support technology development and quality improvement, thereby promoting the structural enhancement of small- and medium-sized enterprises since 1982, and other commercial banks began handling technology development funds with a view to expanding financing for such enterprises in 1983. In the case of venture capitalists, the Korea Technology Promotion Corporation was established in 1974, followed by the Korea Technology Development Corporation in 1981, the Korea Development Investment Corporation in 1983, and the Korea Technology Financial Corporation in 1984. In the early 1980s, the government provided financial support for the machinery, electronics, and textile industries, which became a part of the industrial development fund in 1986. In addition, with the introduction of the Specific R&D Project, the first national R&D project, in 1982, financial support for technology development increased sharply.

As outlined above, the government continuously expanded financial support programs in order to promote technology development. However, the programs lacked comparative advantage in terms of loan conditions, that is, until 1985. Thus, the government introduced a series of measures to expand financial support with new conditions and improve the technology financial support system. In 1986, the government used the oil stabilization fund as a support fund for industrial technology enhancement and established an industrial development fund to foster a new technology investment company. As a result, the technology financing system entered a new phase of financing diversification and differential application of financing conditions for each stage of technology development. This phase included support for basic research and public technologies through the Specific R&D Project, based on a grant-like structure; support for the development of common bottleneck technologies or technology development prior to the privatization stage through the industrial technology enhancement fund; and support for technology development in the privatization stage through financial institutions. With the enactment of the Support for Small and Medium Enterprise Establishment Act in 1985 and the Act on Financial Support for New Technology in 1986, the number of venture capital companies aiming to support the new establishment and fostering of technology-intensive small- and medium-sized enterprises increased significantly.

Korea's technology development support system was focused mainly on the supply side, resulting in weak support for the demand side. Recognizing this, the government began developing policies to promote demand for new technology products in the 1980s—most notably, the government purchase program. The government purchase program began to take shape following the second enlarged meeting for technology promotion on June, 1982, and the measures to reflect the cost of technology development upon government purchases were put in place in the same year. With the implementation of the total bidding system in 1983 and purchase illustration system in 1984, the government purchase program began to improve. With the revision and supplementation of the Budget Account Law in March 1983, the total bidding system, which determined successful bidders through a comprehensive evaluation of quality, performance, and efficiency, in addition to the bid price at the time the purchase contract was made—even though it was limited to only some items—revolutionized the government procurement system, allowing it to maintain the lowest price bid for a long period of time. Next, the purchase illustration system was implemented to promote technology development in industries and ensure sufficient time for production preparation as well as to realize an open purchasing administration by having the government and government-invested organizations illustrate and disclose their medium-term purchase plans for the following year in advance.

Introduced in 1981, the military service exemption for researchers was a system that permitted eligible researchers to work at research institutes for a period of five years instead of serving in the military, thereby allowing industries to secure skilled personnel. Military service exemptions were granted to researchers with bachelor's degrees or higher in science-related fields working at research institutes with 30 or more researchers and equipped with independent research facilities and equipment. In industries, eligible researchers needed to work at corporation-affiliated research institutes registered under the Technology Development Promotion Act with five or more researchers holding master's degrees or higher in science-related fields, while for small- and medium-sized enterprises, the exemptions were granted to those working at institutes with at least three researchers holding master's degrees. With the continuous increase in the number of applicants to the military service exemption system, the government limited the number of researchers granted exemptions to 1,000 in 1985. In 1987, in order to strengthen the support for small- and medium-sized enterprises, the requirement concerning the number of researchers at an institute was relaxed to 10 or more, and 200 researchers from among the total number of researchers were assigned to small- and medium-sized enterprises. It is believed that the military service exemptions for researchers played a major role in securing excellent researchers for industries; as a result, the system was expanded to research institutes in the humanities and social sciences and university-affiliated research institutes in September 1991.

Section 7. Outcomes of Science and Technology Development

In the 1980s, Korea's R&D resources, including R&D investment and personnel, increased significantly. In 1980, R&D investment stood at KRW 211.7 billion, but increased to KRW 1.2371 trillion in 1985 and further to KRW 3.3499 trillion in 1990. The number of researchers in 1980 was 18,434, also increasing to 41,473 in 1985, and further to 70,503 in 1990. The status of R&D resources in the national economy has increased accordingly. The proportion of the GNP occupied by R&D investment was only 0.58 percent in 1980, but increased to 1.56 percent in 1985 and further to 1.88 percent on 1990. Although the number of researchers per 10,000 people was 4.8 in 1980, that number increased to 10.1 in 1985 and further to 16.4 in 1990.

Throughout the 1980s, R&D investment and personnel underwent continuous growth, but both the absolute scale and relative weight lagged behind those of major industrialized countries. In 1990, the absolute scale of R&D investment in the United States was USD 145.46 billion, followed by USD 85.3 billion in Japan, USD 43.61 billion in Germany, and USD 28.61 billion in France; however, it was only USD 4.68 billion in Korea. At the same time, the proportion of the GNP occupied by R&D investment was 2.63 percent in the United States, 2.77 percent in Japan, 2.89 percent in Germany, and 2.33 percent in France, far exceeding Korea's 1.88 percent. In 1989, the number of researchers in the United States was 949,000, followed by 484,000 in Japan in 1990, 176,000 in Germany in 1989, and 124,000 in France in 1990. Accordingly, the number of researchers per 10,000 people was 38.4 in the United States, 39.0 in Japan, 28.5 in Germany, and 22.1 in France.

Looking at the detailed composition of R&D investment, while the relative proportion of private investment increased, the relative proportion of basic research decreased. As pointed out earlier, although private R&D investment occupied only 36.1 percent of total investment in 1980, it grew to 50.0 percent by 1982, 75.2 percent by 1985, and 78.7 percent by 1988, reaching as high as 80.6 percent by 1990. In terms of R&D investment areas, while the proportion of basic and applied research decreased, the proportion of development research increased throughout the 1980s. In 1983, the share of basic research was 18.2 percent, applied research was 28.9 percent, and development research was 52.9 percent. Later, those shares recorded 16.7 percent, 26.5 percent, and 56.8 percent, respectively, in 1986, followed by 16.1 percent, 24.4 percent, and 59.5 percent in 1990.

In the 1980s, with corporations having become actively involved in R&D activities, the main agents of technological innovation became increasingly diversified. Until the 1970s, government-funded research institutes had been responsible for the large majority of R&D activities, but in the 1980s, corporate R&D activities increased sharply. The proportion of R&D investment by the government and the private sector began shrinking in 1982. In 1981, there were only 53 corporate research institutes, but that number exceeded 1,000 as of April 1991. While universities had not been very active in R&D in the 1980s, they began to emerge as the main agent of R&D by around 1990.

In 1980, the proportions of R&D personnel employed by universities, research institutes, and corporations were 47.2 percent, 24.9 percent, and 27.9 percent, respectively. Later, those proportions recorded 36.4

percent, 17.4 percent, and 46.2 percent in 1985 and 30.8 percent, 14.7 percent, and 54.5 percent in 1990. While the relative proportion of R&D personnel at universities and research institutes decreased, the relative proportion of those at corporations increased continuously. In terms of academic degrees, the proportions of doctor's, master's, and bachelor's degrees were 18.5 percent, 25.9 percent, and 55.5 percent, respectively, in 1980, later recording 19.3 percent, 33.5 percent, and 43.5 percent in 1985 and 25.1 percent, 29.0 percent, and 43.6 percent in 1990. Although the proportion of researchers with doctor's degrees increased in the 1980s, the overall proportion remained relatively small, with bachelor's degree holders accounting for around 50 percent of all researchers.

The demand for science and technology in the 1980s led Korea to pioneer advanced science and technology and sophisticate its production technology, with a focus on the improvement of science and technology introduced from foreign countries and promotion of domestic R&D. In addition, the demand for human resources began to shift from the technological improvement of production facilities to technology development through research institutes, and efforts were made to develop human resources by producing more advanced science and technology personnel with doctor's or master's degrees while maintaining a consistent supply of bachelor's degree holders.

With the expansion of R&D resources in the 1980s, the number of science and technology achievements also increased. The number of patents is one of the main quantitative indicators of science and technology achievement. Patent applications in Korea increased more than five-fold, from only 5,070 applications in 1980 to 25,820 applications in 1990. In addition, the number of registered patents increased 4.8-fold, from 1,632 in 1980 to 7,762 in 1990. As these figures show, the numbers of both patent applications and registered patents increased continuously during the 1980s. However, these numbers remained significantly below those of industrialized countries. For example, in terms of the number of patent applications submitted by foreign researchers working in the United States in 1991, Korea recorded 1,355 applications, which was significantly lower than the 38,609 applications by Japan, 13,510 by Germany, and 5,735 by France.

Another indicator of science and technology achievement is the number of academic papers published in international journals. According to the SCI (Scientific Citation Index) database of the United States, the number of papers by Korean researchers published in international journals increased significantly in the 1980s. Starting with the publication of only 159 papers in 1980, the number grew to 555 in 1984, 1,178 in 1987, and 1,780 in 1990. Although this sharp increase in the number of papers published in international journals in the 1980s was a very encouraging phenomenon, it highlighted the incredible lack of research activities in the 1970s. In terms of the number of papers published in international journals in 1990, Korea ranked 33rd in the world, even lower than Taiwan and still far below advanced nations.

Even in the 1980s, Korea's introduction of new technologies continued to increase. The number of such cases was 54 in 1980, increasing to 114 cases in 1985 and 221 cases in 1990. The total cost of these cases of technology introduction was USD 35.5 million in 1980, USD 154.8 million in 1985, and USD 514.1 million in 1990. The continuous increase in the introduction of new technologies suggests that the Korea's main focus in terms of technology development in the 1980s was the improvement of technologies introduced from industrialized countries. In the 1990s, however, the number and cost of cases of technology introduction varied from year to year rather than increasing continuously.

Even though Korea's production and production-related technologies in general approached the level of industrialized countries in 1980s, there was a considerable gap between its core and advanced technologies and those of industrialized countries. For example, Korea's long-term science and technology development plan for the period leading up to the 2000s, established in 1986, stated, "Although the levels of Korea's production and production-related technologies, including processing, assembly, production process, and detailed design technologies, are comparable to those of industrialized countries, its core technologies, including basic design, materials, systems, and software technologies, are far behind those of industrialized countries." In terms of major technology fields, textile, steel, home electronics, and other light industries were at the level where they could compete with industrialized countries, and the machinery, petrochemicals, and industrial materials industries were at the stage of adopting and assimilating key technologies. High-tech industries, including electronics, telecommunications, fine chemicals, automation, and biotechnology, were still in the early stage of development, except for certain areas, such as semiconductors.

Throughout the 1980s, Korea has pioneered new high-tech industries while promoting technological development in its existing industries. As the source of the country's industrial competitiveness began to shift from labor to technology, the government focused more on the qualitative development of specific industries rather than quantitative development, and made efforts to actively develop emerging high-tech industries. This trend was reflected in the change in export goods. In the 1960s, Korea's main export goods were primary and light industrial products; however, that changed to light industrial and heavy/chemical industrial products in the 1970s. In the 1980s, with the increase in the proportion of heavy/chemical products, high-tech products became one of Korea's major export goods.

Table 1-4-1. Changes in Korea's Top 10 Export Goods

Rank	1960		1970		1980		1990		2000	
	Item	Percentage	Item	Percentage	Item	Percentage	Item	Percentage	Item	Percentage
1	Mineral Products	13.0	Textiles	40.8	Textiles	28.8	Clothes	11.7	Semiconductors	15.1
2	Tungsten	12.6	Plywood	11.0	Electronics	11.4	Semiconductors	7.0	Computers	8.5
3	Silk Thread	6.7	Wigs	10.8	Steel Products	9.0	Shoes	6.6	Automobiles	7.7
4	Anthracite	5.8	Iron Ore	5.9	Shoes	5.2	Electronic Imaging Devices	5.6	Petroleum Products	5.3
5	Squid	5.5	Electronics	3.5	Ships	3.5	Ships	4.4	Ships	4.9
6	Live Fish	4.5	Vegetables	2.3	Synthetic Resin	3.3	Computers	3.9	Wireless Communication Devices	4.6
7	Graphite	4.2	Shoes	2.1	Metal Products	2.3	Sound Systems	3.8	Synthetic Resin	2.9
8	Plywood	3.3	Tobacco	1.6	Plywood	2.0	Steel Sheet	3.8	Steel Sheet	2.8
9	Rice	3.3	Steel Products	1.5	Pelagic Fish Species	2.0	Synthetic Textiles	3.6	Clothes	2.7
10	Bristle	3.0	Metal Products	1.5	Electrical Equipment	1.9	Automobiles	3.0	Electronic Imaging Devices	2.1

Source: Korea International Trade Association.

With the advancement of its industrial structure, the Korean economy enjoyed continuous growth. In particular, Korea was recognized as one of the newly independent countries that had achieved the most remarkable economic development, having started from very difficult conditions, after the Second World War. To refer to the countries that had achieved high economic growth rates and rapid industrialization, the terms “Newly Industrialized Country (NIC)” and “Newly Industrialized Economy (NIE)” were introduced and used for countries such as Korea, Taiwan, Hong Kong, Singapore, Malaysia, India, Brazil, and Mexico. Among these countries, Korea, Taiwan, Hong Kong, and Singapore received the most international attention, leading them to be referred to as the “Four Dragons,” and Korea as the “Next Giant in Asia.”

Korea’s continuous technological development was the underlying force behind its rapid industrialization. While focusing on introducing technologies from industrialized countries and utilizing such technologies until the 1970s, Korea began developing the technologies it needed on its own in the 1980s, with the help of aggressive investment. Examples of technology innovation in Korea in the 1980s include the development of the DRAM semiconductor, an administrative network host for the computerization of public organizations, a fully electronic switching system, semiconductor lead frame materials, a hepatitis B vaccine, and nuclear magnetic resonance and computed tomography devices, as well as the localization of VTR head drums and nuclear fuel and the construction of the Antarctic King Sejong Station.

The development of the DRAM semiconductor was led by the private sector. In the early 1980s, Korea’s semiconductor industry began experiencing significant growth with the active participation of large corporations such as Samsung, Hyundai, and Goldstar. In particular, Samsung developed 64KB DRAM in November 1983 and 256KB DRAM in October 1984, thereby reducing the gap between Korea and industrialized countries to around five years. 64KB DRAM was developed based on technology training received from leading companies, while 256KB DRAM was developed through technology introduction and independent development efforts. Since then, Samsung has moved rapidly to close the gap with industrialized countries by independently developing 1MB DRAM in July 1986 and 4MB DRAM in February 1988. The company aggressively replaced existing technologies with new technologies, such as its N-MOS to C-MOS design change for 1MB DRAM and the adoption of the trench method instead of the stack method for 4MB DRAM. With the increase in the containment efforts of the leading companies at the time, Samsung was sued for patent infringement. As a result, in the case of 4MB, 16MB, 64MB, and 256MB DRAM, a national joint R&D project was conducted to promote independent technology development based on cooperation among industries, universities, and research institutes.

Korea’s development of a fully electronic switching system (TDX: Time Division Exchange), however, was led by government-funded research institutes. It was a large-scale technology development project that was carried out over a period of 15 years, from 1977 to 1991. The joint R&D began with the establishment of the TDX development team at the Electronics and Telecommunications Research Institute (ETRI), with personnel from switchboard manufacturers, the Ministry of Communications, and the Korea Electric Communication Construction Corporation. Based on technologies introduced from foreign countries, the ETRI developed the TDX-1 in 1984 and TDX-1A in 1988, which was suitable for commercialization application to rural areas. From then on, private manufacturers worked on upgrading TDX-1A to develop TDX-1B, while the ETRI retained the joint R&D team to lead the development of the TDX-10, a large-scale switchboard. The joint R&D team completed the testing of the TDX-10 by 1990, and commercialized and deployed it in urban areas. Under a long-term vision, the TDX project first selected a product with the potential for significant ripple effects and then followed a step-by-step process to first develop a medium-scale switchboard and then a large-scale switchboard, thereby promoting healthy competition among manufacturers and close cooperation among experts from industries, universities, and research institutes.

Korea's effort to localize nuclear fuel production was pursued by the Korea Atomic Energy Research Institute. In 1981, the government established a nuclear fuel localization plan in order to end its dependence on foreign countries for nuclear fuel and promote the stability of its nuclear energy projects. The plan focused on nuclear fuel for heavy-water reactors based on natural uranium and fuel for light-water reactors based on low-enriched uranium. In the case of fuel for heavy-water reactors, a prototype production facility was first built and tested based on nuclear fuel imported from Canada in 1983, and following the success of testing at the Wolseong Nuclear Power Plant in 1984, a mass production facility with an annual capacity of around 100 tons was built in June 1987. In addition, since 1989, the process of producing nuclear fuel for heavy-water reactors has been fully localized through the independent design and construction of a uranium conversion plant and successful completion of test runs. In the case of nuclear fuel for light-water reactors, under the policy to localize all manufacturing processes except for enrichment, in accordance with the Non-Proliferation Treaty, the Korean government developed nuclear fuel design and manufacturing technology in cooperation with Germany's KWU (Kraftwerk Union) in 1985, and began operating a fuel fabrication plant with an annual capacity of 200 tons in 1988, leading to full-scale production from 1989.

The construction of the Antarctic King Sejong Station was regarded as one of the outcomes Korea's big science projects. When Korea became the 33rd country to join the Antarctic Treaty in November 1986, the government began pursuing the construction of an Antarctic research station, and put the Korea Ocean Research and Development Institute in charge of the project. In March 1987, the institute established an Antarctic research lab and conducted a field survey for the construction of the facilities. In May 1987, the budget and detailed construction plan were drawn up. While the working-level delegation visited South American countries to conduct diplomatic negotiations in September of the same year, the government signed a contract for the design and construction of the Antarctic research station with Hyundai Engineering Co. and Hyundai Engineering and Construction Co. On December 15, 1987, a ship with construction materials arrived at the Antarctic, at which time the construction of the research station got underway. By shipping finished construction materials that had gone through pre-treatment processes in Korea, the construction company was able to complete the station in only two months, ahead of schedule, and the completion ceremony was held on February 17, 1988. With the construction of the Antarctic King Sejong Station, the Korea Antarctic Research Program was established with the aim of gaining a deeper understanding of the Antarctic's natural environment by conducting surveys of natural resources and conservation research. From 1988 to 2003, 16 research projects were conducted at the station.