Technology Transfer Landscape Since The Enactment Of The Technology Transfer Promotion Act Of 2000 In Korea

By Sun R. Kim

Introduction

This article will address a brief history of technology policy and changes to the technology transfer landscape since the passage of the Korean Technology Transfer Promotion Act of 2000 (Enacted Act no. 6229, January 2000)

Korea, as a "catch-up" economy based country, was more prone to imitate than innovate with technological innovations being led by a chaebol firm (a South Korean form of business conglomerate, powerful global multinationals owning numerous international enterprises) that benefited from large-scale investment in R&D and governmental support. Increased and structured investment has been viewed as improving economic performance and boosting productivity

The National Innovation System of Korea is characterized as being government-led, and university-industry collaboration under the system evolved under the influence of the government's science and technology policy.

After the Korean War, the Korean Government was in an urgent need to rebuild the national economy. As a part of its effort to rebuild industrial infrastructure, the government established an industrial technology research institute, the Korea Institute of Science and Technology (KIST) in 1966. KIST played an integral part in Korea's scientific and technological development with its goal to research, develop and transition creative, original technologies. This was followed by the establishment of the Ministry of Science and Technology (MOST) in 1967 to undertake the task of funding basic research for achieving scientific and technological development. To address the weak R&D capacity of both industry and university, the government established for the first time a number of government-funded R&D institutes (GRIs) in selected industries by constructing the DaeDuk Science Park in 1974.

In tune with the government's efforts, the legislature passed the Technology Development Promotion Act of 1972. The Act of 1972 prescribes details relating to the support systems for the establishment and execution of fundamental policies and comprehensive plans in relation to science and technology. The main content of this Act included establishing fundamental policies and comprehensive plans for the promotion of science and technology, including the promotion of developed technology utilization. More importantly, the Act of 1972 enabled contractors, including Government-funded Research Institutes (GRIs), private universities, and private firms, to hold the title to the inventions that are derived from government funded R&D projects.

The 1980s saw an increase in the demand for complex technologies in the market place and in the reluctance of foreign countries to transfer technologies to Korea. A source of economic growth was found in technology-intensive industries from capital intensive industries. Faced with the changes in technology transfer policies by developed countries, in 1982 the government launched the National R&D projects promoting industry–GRI linkage, expanded R&D facilities as top policy objectives placing emphasis on large-scale national projects and turned to using GRIs as major institutes to lead the research and development with a large amount of R&D budget. An interesting observation from this period is that as the R&D capacity of universities and industry expanded by hiring quality scientist and engineers from abroad as well as the acquisition of technology through collaboration with foreign parties, the role of GRIs slowly become smaller than it was structured to be.

After the foreign currency crisis in 1997 universities strengthened the capability of research to meet the society's needs. Private companies also invested more money into R&D to gain competitive advantage in the global marketplace. Korea followed a model of technological development based on national leading companies taking a prominent role in a selected industrial sector. While this model worked sufficiently during an initial period where industry was catching up with developed nations, eventually the government was compelled to invest in indigenous R&D to face the challenges of the global economic environment.

In order to narrow the gap with other industrialized countries, Korea began to recognize the importance of closer working relations between universities and industry and to promulgate technology transfer policies. This recognition, together with the urgent need to move the country to a knowledge-based economy spurred the government on to pass the Technology Transfer Promotion Act (TTPA) of 2000. The Korean government started to shift its policy from technology-push innovation to market–pull innovation. The government reinforced national R&D projects and strengthened the demand-oriented technology development system. The R&D capacity of universities, as well as that of industry, grew remarkably. In 1997, the Creative Research Initiative (CRI) was launched, solidifying the policy shift in science and technology development in Korea from "catch up" to "lead in" toward the knowledge economy of the 21st century.

According to the statistics reported by Ministry of Science and Technology, the Special R&D Program, one of the large-scale national R&D programs spent approximately U.S. 4.7 billion during 1982-2000 on 19,000 projects of which only 4.8 percent was commercially utilized resulting in a reimbursement of 1 percent of the R&D budget back to the government as royalty.

Legal Framework to Promote Public-to-Private Technology Transfer

Originally, each public research institute performed technology transfer activities independently. The most significant pieces of legislation on technology transfer from public institutions and research organizations to the private sector are Science Technology Basic Law, Technology Transfer Promotion Law, Patent Law and the Law for Industrial Education Promotion and Co-operation Boost.

The Science and Technology Basic Law is aimed at planning national economic development by building the basis for science and technology development and innovation and strengthening national competitiveness. The basic objectives of the Law are to establish a comprehensive policy for science and technology development every year based upon statistics gathered by each ministry. Under the Law, the government is obligated to investigate and analyze primary science and technology indexes and statistics on a regular basis, predict developing trends and evaluate the effect of the newly developing science and technology beforehand.

Korea regularly re-evaluates and adjusts its basic plan. Under the Science and Technology Basic Law, the Korean government is required to set up mid-to-long term policy goals and direction for science and technology development in order to achieve the objectives of the law more efficiently. It also prescribes that the Basic Law should include measures for spreading technology transfer and promoting the utilization of the research outcomes. Furthermore, under the Act, the government is obligated to collect indexes and statistics on a regular basis, predict trends and evaluate effectiveness of its policies.

This feedback of information and statistics to policy formulation is important in assessing the effectiveness and efficiencies of the policies. On the other hand, frequent revision and amendments to the relevant laws and legislations relating to technology transfer mean that each funding agency must amend and revise their own relevant regulations on annual basis, which can complicate matters and create much confusion among practioners within universities and industries.

■ Sun R. Kim,
Kims and Lees, Partner,
Seoul, Korea
E-mail: sunkim@kimsandlees.com

The government began to realize that clear and transparent rules covering the ownership of any intellectual property rights developed within public universities or funded with public resources are critical. While the government research funding agencies may also have rules that are specific to any research conducted with such funding, the first national policy that clearly establishes principles of ownership of IP rights developed by university researchers with public funds was TTPA of 2000. The Act not only provided clear and predictable rules of the game for all stakeholders, but also facilitated joint research between different institutions. (See table 1)

Key Characteristics of the Technology Transfer Promotion Act of 2000

Ownership of Intangible Property

Every and each government agency and university had their own unique rules and regulations concerning ownership of intellectual property for invention which, in turn, created much confusion and frustration for private industry in its attempt to gain access to that scientific knowledge, which resulted from such government funded research projects.

In order to address this confusion on the issue of intellectual property ownership, the government passed Regulations on Management of National Research and Development Projects (Enacted Presidential Decree, No. 17429, December 19, 2001)

Table 1. Key Policy Initiatives for Promoting Public-To-Private Tech. Transfer in Korea

Year	Title	Description
1972	Research and Development Promotion Act	Enabled R&D contractors to hold title to inventions developed during the pursuit of government-sponsored R&D (except national and public universities).
1993	New Economic Five Year Plan	Emphasized the role of the government in facilitating transfer of technology from PRIs to industrial firms.
1995	Support Act For Starting Small and Medium Sized Enterprises (revised)	Accelerated the establishment of the technology business incubators within PROs.
1997	Special Measure Act for Science and Technology Innovation	Required the government to develop adequate supporting measures for science and technology innovation, putting the emphasis on technology diffusion and deployment.
1997	Special Measure Act for Promotion of Venture Businesses	Allowed researchers (or faculty members) affiliated to GRIs (or universities) to start up business while keeping their jobs in the parent PRIs.
2000	Technology Transfer Promotion Act	Stipulated that all PROs have a technology licensing office with at least one staff dedicated to carrying out the duty of technology transfer.
2001	Presidential Decree on Management of National Research and Development Project	Uniform guidelines on how to plan, evaluate, manage the national R&D projects.
2001	Patent Law (revised)	Allowed that the national and public universities hold title to in-service invention.
2003	Industry, Education Advancement and Industry-Academia Alliance Promotion Act (revised)	Recommended every university to establish University-Industry Cooperation Foundation (UICF), which merges TLO as a subordinate department thus proving a legal base for UICF (University-Industry Cooperation Foundation)
2005	Act on Performance Evaluation and Management of National R&D Project	Enhance the efficiency and accountability of R&D.
2006	Technology Transfer and Commercialization Promotion Act	Expanded the Technology Transfer Promotion Act of 2000 and placing emphasis on technology valuation and financing for early stage technology.
2007	Industrial Education and University-Industry Cooperation Promotion Act (UICF) (revised)	Allowed universities to establish technology holding companies to boost technology transfer.

(Revised) subsequent to the passage of the TTPA of 2000. Presidential Decree of 2001 was enacted to address matters necessary for planning, evaluation and management of the national research and development, to prescribe key matters such as the issues of intellectual property ownership, evaluation of performance, reporting on the results of research and development, inventor remuneration and the promoting of the commercialization of research results.

Government and public institutions may vest public research institutes (PRIs) or other participating institutions with rights in the results produced from research and development projects advanced or supported with conditions on use attached thereto. In 2001, the revised Korean Patent Act of 2001, effective as of July 2002 enabled the Act of 1971 to include national and public universities under the Article 39.

According to the Act, ownership of research shall belong to the principal research institute according to the terms of the research agreement. However, if the principal research institute is a private company, then the fruit of such research and development belongs to the funding government agency in proportion to the amount of funding. Such rigid legislation on ownership by a private company of the intellectual property resulting from government-funded research and development projects became a hurdle for the private industries to actively participate in joint R&D government-funded projects with PROs. In addition, ownership of inventions resulting from such research was allocated in proportion to the funding of the project rather than in proportion to its contribution to the project itself, which was another discouragement for private industry to collaborate with PROs in government-funded research. In response, the government amended the Regulation of 2001 to extend the ownership provision to private industries under Art.15 (2) of Regulation of 2008, shifting the notion of ownership to contribution to invention rather than to investment.

Concessions for Intellectual Property Without Consideration

The Government may, if necessary to promote industrial development, exempt a licensee from paying royalties or grant a gratuitous concession for such IP to the researchers who have performed the research

and development that generated the IP or to the investors in the research and development projects from which the IP was generated.

Legal Status

Public and national universities were treated as part of the government and were not allowed to operate as independent entities. Due to such legal status, universities did not have the legal capacity to enter into a contract or own any intellectual property rights, *i.e.*, any patent rights. This created a major hurdle because as most of the top universities in Korea are owned by the local state government, they were deemed to be part of the government itself and were obligated to follow a complex process to obtain permission to work with private industry. At the same time, it was a burdensome process for private industry to obtain any scientific discoveries or inventions created at these universities due to governmental protocols. The TTPA of 2000 reversed this statute in order to enable publicly funded universities to work with business and use their technologies and knowledge for commercial purposes.

The Act was completely revised in December 2006 (Amended Act No. 8108, December 28, 2006) providing a legal framework to facilitate financing for technology commercialization via technology valuation and technology-backed securitization, and renamed the Technology Transfer Promotion Act as the Technology Transfer and Commercialization Promotion Act (TTCPA). With the passing into effect of this Act, the government began to put in place the legal and institutional infrastructure needed to consolidate the financing system for investment in early-stage technologies. The law was established to build the infrastructure for technology transfer, the commercialization of technology generated by PROs, the establishment of a technology valuation system and revitalization of technology financing needed to effectively promote technology transfer and commercialization.

Domestic Preference

Domestic preference is given to both ownership of the invention and to the results of the government funded project and to the entity who shall be the licensee. According to Art. 15(4)(5) of the Presidential Decree of 2001 (Amended Presidential Decree, No. 22328, August 11, 2010), where any principal research institute, joint research institute and the participating institutes jointly implement the research with the relevant institute, the domestic institute shall own results of the research and development. For commercialization, a domestic preference is given to a domestic company under the Art.17 (1) where the head of the institute that owns results of the research and development may transfer those rights to the participating corporation, practicing corporation or other appropriate institutes within the country.

Furthermore, the Act prescribes that any public research institute shall, when it intends to allow the use of public technology, assure that the enterprises which desire to use the public technology are given an equal opportunities to such license except that a preferential right may be given to the enterprises that invested in the development of the public technology for a period of time.

Government Obligations

The government now has responsibility to establish and implement policies under the Act. The local government or a public institution shall endeavor by law to secure intellectual property, such as patents, for the result acquired by subsidizing expenses incurred in research and development.

Performance Valuation

In order to increase the efficiency of the R&D investment, the government passed the Act on the Performance Evaluation and Management of National Research and Development Project (Act. No 7808, December 2005). The purpose of this Act is to enhance the efficiently and accountability of investment in research and development by evaluating the activities of research and development in the field of science and technology promoted by the Government.

The policy arose out of the realization that, unlike private firms, GRIs and universities lacked an incentive to actively transfer those technologies that resulted from their R&D. This law essentially required researchers to disclose their inventions to their TLO (Technology Licensing Offices) and allowed the transfer of the government-funded inventions to universities.

The enactment of the Laws on Industrial Education and Industry-University Cooperation in 2003 (the Laws of 2003) mandated each university to establish an academician-industry corporation foundation with authority to manage all the R&D projects of the university. According to the Laws of 2003, these foundations may include TLOs as their sub-organizations so that small–scale TLOs in most universities are likely to become subsidiaries of the large-scale foundations. TLOs have existed since 1999 but it was only in 2004 that TLOs grew within the industry-university cooperation foundation. The Laws of 2003 enhanced the technical competitiveness of all the industries. By establishing and implementing policies appropriate

for facilitating the transfer of technologies developed by public research institutes to the private sector for commercialization, as well as the smooth trading and commercialization of technologies developed by the private sector, it contributed to the growth of the national economy.

Technology Transfer Infrastructure: Creation of Korean Technology Transfer Center (KTTC)

The TTPA Act required government-sponsored research institutes (GRIs) to set up a Technology Licensing Office (TLO) with at least one staff member dedicated to carrying out the duty of technology transfer. Revised in December 2001, the Act prescribes that it is now mandatory for national and public universalities to establish their TLOs. On the basis of this legislation, universities began to set up foundations for facilitating industry-university cooperation.

A major result of the Law was the establishment and operation of the Korean Technology Transfer Center (KTTC), the designation of local technology transfer organizations, the establishment of technology evaluation organizations, and exclusive technology transfer teams within public research organizations, the cultivation of private technology transfer organizations and the technology transfer business.

Table 2. Number of Patent Applications by PROs in Korea
(130 Government Research Institutes (GRIs), 151 Universities)

Year	University	GRI	Industry
1995	133	—	—
1996	141	—	—
1997	204	—	—
1998	327	—	—
1999	480	—	—
2000	627	—	—
2001	711 (1.0%)	2,024 (2.9%)	49,012 (69.1%)
2003	1,692 (1.9%)	3,185 (3.6%)	63,917 (71.9%)
2005	2,905 (2.4%)	4,453 (3.7%)	90,671 (74.4%)
2006	4,309 (3.5%)	5,898 (4.8%)	112,778 (91.7%)
2007	6,554 (5.1%)	6,710 (5.3%)	114,333 (89.6%)
2008	7,392 (5.9%)	7,977 (6.3%)	110,479 (87.8%)

Compare to the number of patent files by universities prior to Technology Transfer Promotion Act 2000 and Patent Act 2001

Source: Korean Intellectual Property Office

The KTTC is a special legal entity incorporated pursuant to the Technology Transfer Promotion Act of 2000 under the support of Ministry of Commerce, Industry and Energy with funds from both the private and public sector. This function was merged with the Korea Institute for Advanced Technology (KIAT) under the revised Act of 2008.

KTTC has created a technology platform where new technologies are turned into new business opportunities through such means as technology incubation and transfer, and has been the center for information flow of technologies through its management of Technology Licensing Organizations (TLOs), Regional Technology Trade Centers (RTTCs) and the National Technology Bank.

Changes Since the Enactment of the Technology Transfer Act of 2000

Having the legal infrastructure in place since 2000, the growing interests of universities in protecting their inventions can be seen from the increasing number of patent applications that have been filed. In addition, as PROs recognize the importance of promoting transfer activity, the commercialization of technology assets for the benefit of the general public and a growing interest in generating more revenue from such assets, PROs have steadily increased patent filing as demonstrated in Table 2.

Together with the increasing number of patent filings by PROs, an increase in the number of technology transfer transactions from 2004 to 2007 indicates how the enactment of the Technology Transfer Promotion Act contributed to acceleration of technology diffusion from PROs, as indicated in Table 3.

With the increase in number of patent applications by PROs and accelerated activities in technology transfer from PROs, the royalty income also jumped as indicated in Table 4.

In the year 2003, 133 technology transfer cases were reported from 19 private universities. The number of TLOs increased from 32 in 2003 to 80 in 2006 (Korea Research Foundation 2007).

Looking Forward

There are still challenges to overcome in the Korean legal system and policy in licensing of the results and inventions resulting from government R&D. Poor commercialization of academic technologies intermingled with an imperfect technology transfer system, the lack of licensing experience, the immaturity of socio-economic circumstance, and an inadequacy of legal system and govern-

Table 3. Technology Transfer Ratio of PROs

Type	No. of Technologies 2004 (A)	No. of Technologies Transferred 2004 (B)	Ratio (B/A)	No. of Technologies 2007 (A)	No. of Technologies Transferred (B)	Ratio (B/A)
University	13,644	1,121	8.2%	23,094	3,259	14.1%
GRI	21,822	5,449	25%	32,664	9,232	28.3%
Total	35,466	6,570	33.2%	55,758	12,491	42.4%

Technology Transfer and Commercialization Report in 2005 and 2008

Table 4. Royalty Income (Unit: Million won)

Type	2003	2004	2005	2006	2007
University	2,250 (4.6%)	3,177 (5.6%)	6,878 (10.0%)	8,002 (9.8%)	8,002 (9.8%)
GRI	46,846 (95.4%)	53,313 (94.4%)	61,853 (90.0%)	74,027 (90.2%)	89,342 (85.6%)
Industry	49,096 (100%)	56,490 (100%)	68,730 (100%)	82,030 (100%)	104,413 (100%)

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ment policy have slowed the anticipated growth and advancement in the technology transfer area.

In response to the structural hurdles in coordinating the national research and development administrations, the current administration has formulated a strategy for reforming the Korean R&D system by re-organizing governmental agencies. The new government has also launched the Ministry of Education, Science and Technology (MEST) whose role is to coordinate and the Ministry of Knowledge Economy (MKE). In this fashion, the government is in process of reshaping and amending the legal and institutional infrastructure to create an environment to promote technology diffusion to steer the nation into the knowledge based economy.

The shaping of technology transfer polices in Korea still have a long way to go and will face more challenges in coming years. It is hopeful that continuing concerted effort by the law makers, universities and the private industry will accelerate the technology diffusion to society from the knowledge enriched PROs and close collaboration between PROs and private industries. ■