XXV IASP World Conference 2008

The Evolving Roles of Korean Technoparks and Their Futures: A Case of Gyeongbuk Technopark

Parallel Session 2:

Policies that drive Innovation

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Executive Summary:

This paper reviews the current transformation and evolutions of Korean technoparks, based on the case of Gyeongbuk Technopark. The second stage of Korean Technopark project has been underway and functioned as one of core means for regional technology innovation and economic development. Since 2003, Korean government set a new political agenda: nationwide balanced development through devolution and innovation. To deliver this agenda successfully, the government designated 8 existing and 8 additional technoparks as networking hubs of regional innovation agencies. Since then, the major characteristics of technoparks have drastically changed to act as a catalyst for regional economic development or revitalization. Thus, technoparks are being asked to transform themselves toward a regional development agency which endeavors to respond to regional key stakeholders' expectations to work as a regional innovative hub with regional uniqueness. Of course, technoparks should be more supported with mid-long term strategies and well prepared legal systems in both name and reality.

Keywords:
Technopark, Regional Innovation System, Regional Development, University-Industry-Government Relations

1 Introduction

The world has been transforming itself with the axis of its knowledge-based economy. The creation of knowledge and incessant technology innovation expand knowledge inheritance based on both regional and sectional networking, an essential ingredient to determine global competitiveness of a nation. To meet such an increasing global demand for knowledge economy, most countries have focused on an important industrial policy setting up the pivotal base for innovation and invested in and developed science parks. The primary objectives of the establishment of science parks are to be a seedbed and an enclave for technology and "to play a role of incubator" and to act as a catalyst for regional economic development or revitalization[1]. Some states have also hoped the science parks to (a) raise the level of technological sophistication of local industries, through the promotion of industrial R&D; (b) attract foreign investments, especially in higher value-added activities; and (c) accelerate the transition from a labor-intensive economy to a knowledge-intensive one[2].

Korean government has also set various research complex projects to upgrade research and development (R&D) base; however, many of them turned out to be time-consuming and couldn't perform well because general infrastructures of social and economic conditions were not ready for the hope despite the enormous input from the central government. The main reasons also included the low level of financial support, the lack of strong infrastructure, inexperience on technology innovation and little connection between technology and commercialization.

In the late 1990s, many Asian governments such as Taiwan, Singapore and Malaysia were particularly keen to invest in new science parks in an attempt to enhance economic competitiveness and to replicate the success of Silicon Valley. To overcome the limitations of its previous experiences, Korean government designated 8 technoparks in 1998 and, from 2003, added 8 more. It attempted to promote science parks as a strategy to develop new growth engines and introduced the policy for technological innovation: the so-called Technopark project as one of the new alternative projects.

Despite these external growths of technoparks, academic research on technoparks in Korea remained limited. These papers (e.g., No et al.[3]; Lee et al.[4]) mainly focus on the operational problems of technoparks and policy implications or ideas for improving technoparks at the national level. Even though the broad and overall analyses may be useful in developing abstract models, these outcomes or suggestions can be too abstract or idealistic to be implemented in Korean technoparks. In order to develop more practical suggestions, there is also a need of understanding of the interactions of actors involved in each technopark.

To remedy the limitations of previous studies, this paper attempts to evaluate activities of one well-performed technopark, Gyeongbuk Technopark, as an outstanding example, that the government selected fourth times as the best institution between 1999 and 2003. In doing this, this paper first reviews the relevant literature about science parks and university-industry-government

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[1] Felsenstein, D (1994) University-related science parks-'seedbeds' or enclaves of innovation?. *Technovation* 14(2): 93-110

[2] Koh, F, Koh, W, Tschang, T (2005) An Analytical Framework for Science Parks with an Application to Singapore. *Journal of Business Venturing* 20(2): 217-239

[3] No, KH, Ryu, KM, Nam, SM (2004) Problems and Improvements of Korea Technopark Projects. *Korea East and West Economic Study* 15(2): 57-84 (in Korean)

[4] Lee, SK, Park, SC, Lee, KR (2004) Build-up of Regional Innovation Systems and Roles of Technoparks. *National Territorial Planning* 39(2): 255-270 (in Korean)

(UIG) relations in order to develop relevant questions for this research. In the following sections, it examines the brief history of Korean technoparks and the performances of Gyeongbuk Technopark.

2 Science Parks and University-Industry-Government (UIG) relations

A science park is generally defined as a place to function as business support and technology transfer mechanism that encourage and support the startup, incubation, and development of innovation, and development of innovation-led, high-growth, knowledge-based businesses[5]. There are various types of R&D conducted in science parks and the industry sectors they focus on. Some science parks are focused on basic research (e.g., the Cambridge Science Park), while others are on applied research (e.g., the Singapore Science Park)[6]. There are also other science parks that put their emphasis on commercialization or strong manufacturing capabilities, either within a park itself or in its region (e.g., the Hsinchu Science Park in Taiwan). By attracting new firms to locate within or in its region and forming clusters, science parks can create substantial agglomerative effects for the regional economy. Thus, the studies cover a range of geographical localities, such as Storey and Tether[7], who provided an overview of science parks in Europe; Lofsten and Lindelof[8][9] on science parks in Sweden; Athreye[10] on the agglomeration and growth of the Cambridge science district; Saxenian[11][12] on the Hsinchu Science Park in Taiwan; Conceicao et al.[13] on Italian technology parks; and Kihlgren[14] on the St. Petersburg Technology Park in Russia.

In the economic geography perspective, a science park and its surrounding region are regarded as an entity consisting of specialized firms with an evolving structure of interfirm linkages and agglomerative effects. Roles and contributions of science parks are examined in the context of regional development or regional innovation system (e.g., Storper and Harrison[15]; Markusen[16]).

In the institutional perspective, however, a science park is considered an institution providing

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[5] Koh et al., op cit.
[6] Ibid.
[7] Storey, DJ, Tether, BS (1998) Public policy measures to support new technology-based firms in the European Union. *Research Policy* 26: 1037-1057
[8] Lofsten, H, Lindelof, P (2002) Science parks and the growth of new technology-based firms-academic-industry links, innovation and markets. *Research Policy* 31: 859-876
[9] Lofsten, H, Lindelof, P (2003) Determinants for an entrepreneurial milieu: science parks and business policy in growing firms. *Technovation* 23(1): 51-64
[10] Athreye, SS (2002) Agglomeration and growth: a study of the Cambridge Hi-Tech Cluster. *Stanford Institute for Economic Policy Research Discussion Paper 00-42*. Stanford University
[11] Saxenian, AL (2001) The Silicon Valley-Hsinchu connection: technical communities and industrial upgrading. *Berkeley Planning Journal* 15: 3-31
[12] Saxenian, AL (2001) Taiwan's Hsinchu region: imitator and partner for Silicon Valley. (Paper presented at the) *Conference on Silicon Valley and Its Imitators*. July 28
[13] Conceicao, P, Heitor, MV, Piperno, W, Rubini, D (2002) Perspectives for the observation of Italian technology parks. *(Paper presented at the). 6th International Conference on Technology and Innovation*, August 12-15, Kansai Japan
[14] Kihlgren, A (2003) Promotion of innovation activity in Russia through the creation of science parks: the case of St. Petersburg (1992-1998). *Technovation* 23(1): 65-73
[15] Storper, M., & Harrison, B. (1991). Flexibility, hierarchy and regional development: The changing structure of industrial production systems and their forms of governance in the 1990s. *Research Policy*, 20, 407-422
[16] Markusen, A (1996) Sticky places in slippery places: a typology of industrial districts. *Economic Geography* 72(3): 283-313

assistance for its tenants in specific policy-based or mechanism-based ways. This view emphasizes issues such as the functioning of incubators and degree of spin-offs and of whether science parks confer competitive advantages to their tenant firms as well as positive spillover effects to firms located in their complex and their regional economy. The tendency to view and promote science parks as specialized infrastructure to house technology-based firms has particularly focused on the direct and tangible contribution of science parks and the institutions and mechanisms within them. For instance, these include job creation and quality of employment, contribution to R&D investment and output, venture capital raised, as well as the roles of universities with the science parks. Other foci are on the challenges of enterprise formation (e.g., Lofsten and Lindelof[17]; Bakouros et al.[18]), the incubation aspect (Westhead and Storey[19]; Westhead and Batstone[20]) and the issues of financing and the role of universities (Vedovello[21]; Lofsten and Lindelof[22]).

In nature, most science parks have more or less formal and operational links with institutions such as universities and research organizations. The institutional framework of UIG relations, the "top-down" approach, is based on the roles of institutions. In particular, the government designs new agencies and develops various legislative and institutional mechanisms. Most countries which have developed various types of UIG relations incorporate some independent bodies to implement their industrial policies and provide financial supports (Sutz[23]; Inzelt[24]). Korean government has also provided top-down mechanisms developed at the highest level. One of the distinct historical cases was the formation of Daeduck Science Park (DSP) in the early 1970s. The Park Chung-Hee government enforced the Ministry of Science and Technology (MST) to develop an industrial cluster in Daejon region where social actors were easily able to access to the nation's transportation networks of highways and railroads. The MST had responsibility for planning and coordinating a developing process of the science park, the Ministry of Construction provided coming actors with public services such as electricity and water, and the Ministry of Education supported them to build new schools and relocate universities to that area. Alongside the state-centered industrialization policies, some government research institutes had to move into this area. From the 1980s, some private research institutes of big conglomerates were also induced to relocate to the park. Nowadays, a large number of research institutes within the complex of the DSP have developed and commercialized many technologies, and cooperated with the private sector. As a result, the DSP has been positioned as the major axis of scientific research and development in Korea[25].

With the experience from the DSP, the intention of the UIG mechanism by the Korean government has recently become apparent. Promoting UIG activities is a major policy priority in

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[17] Lofsten and Lindelof, op cit.
[18] Bakouros, YK, Mardas, DC, Varsakelis, NC (2002) Science park, a high tech fantasy?: an analysis of the science parks of Greece. *Technovation* 22: 123-128
[19] Westhead, P, Storey, DJ (1995) Links between higher education institutions and high technology firms. *International Journal of Management Science* 23(4): 345-360
[20] Westhead, P, Batstone, S (1998) Independent technology-based firms: the perceived benefits of a science park location. *Urban Stud* 35(12): 2197-2219
[21] Vedovello, C (1997) Science parks and university-industry interaction: geographical proximity between the agents as a driving force. *Technovation* 17: 491-502
[22] Lofsten and Lindelof, op cit.
[23] Sutz, J (2000) The University-industry-government relations in Latin America. *Research Policy* 29: 279-290
[24] Inzelt, A (2004) The evolution of university-industry-government relationships during transition. *Research Policy* 33: 975-995
[25] Shin, D-H (2001) An alternative approach to developing science parks: A case study from Korea. *Papers in Regional Science* 80: 103-111

Korea, as an array of institutional supports and a legislative action such as the *1998 Special Act for Supporting Industrial Technology Cluster (Technopark)*. The government designated 6 role models or exemplar technoparks to implement these functions in 1998. To put more speed on the project, the government even ruled a special supportive law which could remove time-consuming bureaucratic barriers for the plan. Further, since 2003 when the new government came to power, the government has attempted to foster technoparks as an important means for regional technology innovation and economic development[26].

However, this type of top-down approach appears to have some short-comings. In qualitative and quantitative terms, firms' involvement is below expectation. When firms' demands are identified, knowledge relevance of the problems can create a new problem. Finally, there is a low impact on the general behavior of firms regarding relationships with universities. In particular, mismatches between university and industry tend to be higher in some situations where the state has a weak initiative to bring together universities and industry, where unfavorable relationships among actors have been experienced and where socio-economic inequality is widespread. Thus, government's policy intervention may achieve less than expected innovative consequences[27][28].

Despite these limitations, the top-down approach is of importance in that it can potentially open to the sectoral, regional or national level, and cooperation and communication can help actors develop new joint projects that result in better outcomes than their original goals[29]. The institutional infrastructure and microeconomic relations among agents and enterprises endure far longer[30]. In this regard, Cyert and Goodman[31] argue for developing an organizational learning perspective in order to build an environment where the university and the firms continue to create common goals and maintain their cohesion. They argue that in evaluating the effectiveness of alliance between a university and a firm, researchers should not too much focus on short-term, visible outcomes such as new software, quality or sales.

Alongside the initiative roles of the government, other actors' activities have become much important. This is because universities are increasingly progressive in building joint research partnership with industries[32], because industries want to produce a higher productivity through the alliance with universities[33] and because government's decentralization policies attempt to develop a new driving force for economic growth in regions as well as a nation[34]. With the changes of actors' purposes and goals, UIG relations have evolved according to the level of development and to the historical and institutional traditions of each nation. This evolutionary pattern has transformed from ad hoc relations to the state-centered approach, to interactions among

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[26] Lee et al., op cit.
[27] Sutz, op cit.
[28] Audretsch, DB, Lehmann, EE (2005) Mansfield's missing link: the impact of knowledge spillovers on firm growth. *Journal of Technology Transfer* 30: 207-210
[29] Cyert, RM, Goodman, PS (1997) Creating Effective University-Industry Alliances: An Organizational Learning Perspective. *Organisational Dynamics* 25(4): 45-57
[30] Cooke, P (2005) Regionally asymmetric knowledge capabilities and open innovation: Exploring 'Globalisation 2' – A new model of industry organization. *Research Policy* 32: 1128-1149
[31] Cyert and Goodman, op cit.
[32] Woolgar, L (2007) New institutional policies for university-industry links in Japan. *Research Policy* 36: 1261-1274
[33] Motohashi, K (2005) University-industry collaborations in Japan: The role of new technology-based firms in transforming the National Innovation System. *Research Policy* 34: 585-594
[34] Inzelt, op cit.

university-industry-government, and to horizontal and overlapping cooperation among the actors. Motohashi[35] argues that Japanese innovation system evolves toward a dynamic and network-based system, characterized by active external collaboration with various parties to the process of innovation. In a Triple Helix of UIG relations, the main sources of innovation are not fixed in a given order but produce complex entangled problems for actors to solve[3637].

Systems can remain in transition processes. Integration within one system cannot be taken for granted in a situation where the government policy directions have gradually transformed from the initiator of UIG relations to a stimulator that creates a healthy business environment for participants[38]. The government should add the bottom-up approach deriving from a problem-solving relation where involved actors need knowledge to solve a problem and other actors have the capacity to find out a possible solution or improvement through research and development. Thus, technological innovation may demand for reshaping a new organization or a community. Important are interaction and partnership among firms and between other actors, including university and research institutes. Cooperation and collaboration among actors involved contribute to innovation, knowledge diffusion and research tasks[39]. To supplement the limitations of systems, there is a need of roles of a third actor, or a bridge builder, to diffuse the innovative interaction mechanism. Even if this third actor is not a key member of UIG relations, its intermediary roles are of importance to implement and promote the actors' collective goals[40]

The lens of the institutional approach helps us infer some important questions to examine a Korean case. Within technoparks, what are the main goals of the actors involved and how they interact in order to achieve their goals? In that, Korean government has stressed the roles of the third actor to promote UIG relations and cooperation among the participants, what are the roles of a third actor in technoparks and how does it function to coordinate the actors' interests? In answering these questions, this paper examines a historical case of the Gyeongbuk Technopark and uses data both from secondary sources such as articles and publications and primary ones such as newspapers, documents and interviews.

3 The brief history of Korean Technoparks

Until the late 1990s, the Korean governments implemented various industrial policies for technology development. In particular, from the 1990s, it mainly focused on establishing high-tech industrial parks in order to develop high-tech industries, prepare for knowledge-based society and revitalize local economy. Despite its efforts, the expected performances remained low. These included the low spill-over effects on technology transfer and low commercialization of newly developed technologies. For instance, despite the government's financial and administrative supports, the good performances of the DSP on scientific research and development have insignificantly been transferred toward business activities or commercialization[41]. Further, although

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[35] Motohashi, op cit.
[36] Etzkowitz, H, Leydesdorff, L (2000) The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university-industry-government relations. *Research Policy* 29: 109-123
[37] Inzelt, op cit.
[38] Mueller, P (2006) Exploring the knowledge filter: How entrepreneurship and university-industry relationships drive economic growth. *Research Policy* 35: 1499-1508
[39] Inzelt, op cit.
[40] Sutz, op cit.
[41] Song, YP, Park, YK (2005) Current Status and Development Methods of Regional Revitalization Policies. *Issue Paper*. SERI (in Korean)

the government implemented business incubator program in order to revitalize local economies, create jobs, and nurture high-technology industries, the performances of most business incubation centers were very marginal.

To overcome the weaknesses of its top-down approach, Korean government in 1997 designated 6 pilot technoparks and attempted to merge with bottom-up approach. It aimed to improve technological innovative base and infrastructure and subsequently to activate regional economy through the region-based technology innovation system. In addition, it had a mission of upgrading regional economy through networking and cooperation between industries, academia, research centers and local governments. Ultimately, the government hoped to reduce the time gap between scientific research development and commercialization and establish an effective and efficient mechanism for technology transfer[42]

In doing this, each technopark established its own organization or foundation. As a bridge builder, each organization led to the participation of local governments, colleges, research centers and enterprises. That is, business incubation, R&D, education, business support and production functions could be done in a way of one- stop activities under one roof. Thus, technopark has become a technologically intensive industry park which puts every essential function on a single spot for effective high-tech industry development[43].

At the early stage, technoparks functioned as high-tech industrial complexes to develop regional economy. The main objectives of the technoparks were as follow:

- Technopark would accelerate technology innovation through networking amongst industry, colleges, and research centers of the region and generate synergy effect while establishing clustered infrastructures of the region.
- Technopark project could be a means of using the human resources of academia and others directly to enhance Korea global competitiveness as well as a center for developing high technology and regionally specialized technology.
- Technopark could give an opportunity to reinforce collaboration and fellowship between participants.
- Technopark could enhance technology innovation of regional industry through technology support for SMEs.
- Technopark project could boost the regional economy and enhance national competitiveness through industry development based on high technology.
- Technopark project could encourage activation of regional economy through supporting start-up business, transforming industry structures, attracting foreign high tech companies, creating more jobs, and increasing income taxes.

There were also diversities among technopark systems. For instance, regarding the complex structures, such technoparks as Gyeonggi and Gyeongbuk were established within involved universities while Daegu and Chungnam technoparks took a pattern of network where the actors dispersed at university campus, industrial complex and in regions. Further, Daegu technopark and Gyeongbuk technopark held a relatively high proportion of universities to total investment while

[42] Choi, YH, Hwang, WI (2003) The support system for Venture Firms at Korean Technoparks. *The Korean Venture Management Review* 6(2): 127-152
[43] ibid.

private firms and universities in Pohang one and Busan one showed a high degree of investment[4445].

At present, 16 Technoparks established the Korea Technopark Association (KTA) to share information and their common concerns. The KTA has built network for information exchange and common projects. Table 1 shows the outlined information of 16 technoparks.

In comparing with the outcomes of the government's other innovation policies, the performances of technoparks were much higher and greater. Yet, the degree to which these technoparks had achieved their goals remained at an early stage. Most technoparks paid a little bit heavy attention to establishing physical infrastructure and operational parts while their goals for incubating and R&D were yet marginal[46]. Given the fact that fostering technoparks is fundamentally characterized as a long-term, inter-connected innovation policy, it seems to be too early to evaluate the accurate performances of technoparks. Nevertheless, some problematic symptoms appeared. First, technoparks' businesses were largely duplicated and failed to develop regionally specialized and differentiated business areas. Second, local governments and universities had the low capacities to plan and implement their distinct innovation schemes. Third, academic experts or professors showed limited interests in participating in technoparks. They were less active in educating management and technology advice. Trust and cooperation between universities and businesses for developing new technology or businesses remained in the low level[47].

4 The Gyeongbuk Technopark: Its early function for business incubation

Gyeongbuk Technopark Foundation (hereafter, GBTP), designated as a model technopark by the MOCIE as other 5 pilot technoparks, was established in August 1998. It is located in the city of Gyeongsan. Geographically, Gyeongsan is located in the southeast of Korea and next to Daegu, the fourth largest city in Korea. In addition, there are several universities and industrial complexes in Gyeongsan. In more detail, the GBTP is located on the campus of Yeungnam University, covering 153,120㎡. Its major stakeholders are Gyeongbuk Provincial Government, Gyeongsan-city Government, Gyeongsan Chamber of Commerce and Industry, Yeungnam University, Daegu University, Kyongil University, Daegu Hanny University, and Catholic University of Daegu. The total fund amounted to 99.7 million dollars, one fourth of which came from central government, the MOCIE, and one fifth from Gyeongbuk Provincial Government (GBTP, www.gbtp.or.kr).

4.1 The business incubation coordinated by the GBTP

As other technoparks did, the early main purpose of Gyeongbuk Technopark was to incubate new venture enterprises. GBTP provided support such as venture fund, business promotion, investor relations, expositions, technology transfer, and even brokerage of researchers. In fact, GBTP's incubation is concentrated on networking between entrepreneurs with technology and relevant parties such as venture capitalists and marketing experts. That is, GBTP's incubation sought to connect "think" with "do." It meant that GBTP tried to link talent, technology, capital and

[44] Kim, KS (2002) Total Management System of Korean Technoparks. *Policy Study*. STEPI (in Korean)
[45] Choi and Hwang, op cit.
[46] Kim, HM (2003) Evaluation and Future Tasks of Technopark Build-up Projects. The Korean Association for Public Administration *2003 Summer Academic Conference Proceedings* (in Korean)
[47] Choi and Hwang, op cit.

know-how effectively one another in order to leverage their talent, accelerate the development of new companies and speed the commercialization of technology[48].

[48] Rhee, J (2004) Gyeongbuk Technopark: Roles of Technoparks in the regions. *Regional Information Paper* 30: 103-6 (in Korean)

Table 1. Technoparks in Korea
(unit : ㎡, US million dollar)

Technopark	Location	Space	Time Established	Total Fund
Gyeongbuk TP	Yeungnam University	153,389	August 27, 1998	99.7 (27.2)
Songdo TP	Songdo	453,523	June 18, 1998	182.8 (26.2)
Gyeonggi TP	Hanyang University	200,000	September 17, 1998	120.6 (26.1)
Daegu TP	Daegu & Gyeongbuk University	37,019	December 2, 1998	127.2 (26.7)
Gwangju TP	GwangJu HighTech Complex	99,198	December 7, 1998	72.7 (26.4)
Chungnam TP	Chonan/ Asan	198.772	December 7, 1998	116.3 (27.0)
Pohang TP	Pohang	187,324	Febraury 28, 2000	77.3
Busan TP	Donga Univ.	170,471	December 18, 1999	97.3
Jeonbuk TP	Jeonju HighTech Industry Complex	66,000	December, 2003	70.5
Chungbuk TP	Ochang Science & Industry Comlex	254,547	December, 2003	55.5
Jeonnam TP	Yulchon Industry Comlex	66,000	December, 2003	64.5
Gangwon TP	Chuncheon Sinbuk-up	135,538	December, 2003	64.6
Gyeongnam TP	Changwon Bankye-dong	66,000	December, 2004	66.9
Ulsan TP	Ulsan Daun-dong	105,786	December, 2004	43.2
Gyeonggi Daejin TP	Pocheon	99,174	March, 2005	71.0
Seoul TP	Seoul Nowon-ku	175,207	September, 2005	73.0

Source: ITEP, Regional Innovation Project GuideBook, 2006.

Of course, in order to avoid unnecessary competition and conflicts with local university (but rather small) business incubators, GBTP has concentrated on co-incubation based on shared equipment, shared support programs and shared expertise and active exchanges between business supporting institutions or managers. More importantly, it has strategically concentrated on helping promising but temporarily difficult venture companies develop further. It means that the substantial outcome, not superficial numbers, has been a key consideration. The technopark has also emphasized Post-BI, aiming to nurture companies that have already entered growth stage after start-up stage. For instance, regarding business incubation, it has been prioritized such venture companies that have technologies and growth potential but suffer from shortage of money and facilities and lack of management skills. GBTP has provided them with the services such as production test, manufacturing facilities, equipment test, consulting, marketing services and even funding. Sometimes, it has also provided manpower through mobilization of researchers and students based on networks of experts from various areas including participating universities and professors. About 30% of resident firms in GBTP have had difficulties in securing technicians, and companies particularly in growth stage were suffering serious shortages of employees such as researchers, core technicians and specialized engineers. In this regard, GBTP has actively supported the firms so that they could find desired employees through university employment centers and employment stabilization centers. Lack of human resources has not only become a stumbling block to promising companies that have carried out long-term development and projects based on accumulated technological know-how, but it has also moved resident firms which wanted to secure needed employees, to other regions, metropolitan areas (ex: Wontechnology, Jamova C.L.S Co., Ltd.). In addition, GBTP aimed to improve effectiveness of business incubation based on networks that link experts of various areas to resident companies to deal with screening, management consulting, public relations, marketing, law, patent and expositions.

Table 2. Main Achievements of GBTP's Business Incubation (Incubation Status)

Distinction	1999	2000	2001	2002	2003	2004	2005	Total
New companies	51	39	41	30	19	28	20	228
Existing companies		48	51	53	53	53	59	
Exit	3	36	39	30	19	21	13	161
Current number	48	51	53	53	53	60	66	67
Sales	-	US$ 7.0 million	US$ 7.5 million	US$ 16.4 million	US$ 20.8 million	US$ 22.3 million	US$ 54.4 million	US$ 128.8 million
Export	-	US$ 0.5 million	US$ 3.5 million	US$ 2.2 million	US$ 3.0 million	US$ 6.0 million	US$ 10.2 million	US$ 25.4 million
Employees		253	409	409	483	417	411	2,382

Source: GBTP, Internal Document by Department of Business Incubation, 2006.

Table 2 shows the performances of the business incubation businesses of GBTP between 1999 and 2005. In this period, 228 firms were attracted and among them 161 left the park, so that 67 firms are still in business within the park. The trend shows that overall numbers of the firms within the park tend to increase continually from 48 in 1999 to 67 in 2005. The total sales of this period recorded US$ 128.8 million. As the economic performances of the firms within the park continued to improve, their sales also continued to increase from US$ 7.0 million in 2000 to 54 in 2005. Alongside, their annual exports rose from US$ 0.5 million in 2000 to 10.2 in 2005.

Based on the data and experiences, we found the following success factors that we thought contribute to such positive outcomes. (1) The successful firms made the most use of internal and external infrastructure with an open mind. (2) They were established by experts who have experiences in the field or worked in a similar area for a long time in which high rate of success was recorded by operating the companies with their know-how (experiences). (3) They were able to develop prototype products and implement mass production in a short time after establishment of businesses. (4) They reduced financial burden at earlier stage by renting equipments and offices. (5) They had both clear goals (clarity, achievement) and operation strategy (concreteness, realization). (6) They built an effective network with supporting institutions, tenant/ off-line firms, finance/business- consulting firms, government/local communities and even other competitors.

Despite these successful performances of GBTP, deep-rooted problems in the Korean society continued to exist. As mention above, the cooperation between universities and business was problematic. Although university professors and entrepreneurs informally agreed that cooperation between each other is necessary for regional economic development, the both took a different position when they had to form an official or formal contract. Because of their heterogeneous interests, it was extremely difficult for GBTP to coordinate their interests and build the structure of a virtuous circle. As Jeon and Kim argue[49], universities held only a few intelligent scholars who had core capacity to initiate university-business cooperation and commercialization of their research outcomes. They also did not have an effective incentive system, such as the government's significant financial supports for R&D, to commit the regional economic development. Thus, in delivering the government's plan for promoting venture firms in regions and revitalizing local economy through the UIG relations, the roles of GBTP have become very important but limited.

5 Toward a Regional Development Agency

Since 2003, when the Roh, Moo-Hyun government came into power, the nature of technoparks began to change. Focusing on distributive policies, the government planned to relieve the unbalanced development between regions and set up a new political agenda: so-called all country's balanced development between regions through devolution and innovation. To deliver this agenda successfully, the government designated 8 existing and 8 additionally newly established technoparks as hubs of networking of regional innovation agencies such as enterprises, universities, research institutes and local governments. Thus, the major characteristics of technoparks have been changed to act as a catalyst for regional economic development or revitalization and to promote economic growth.

[49] Jeon, KK, Kim, HY (2001) Comparative Analyses between Universities of Academia and Industry Cooperation Projects. *National Territorial Planning* 36(6): 259-274 (in Korean)

Technoparks could be at the heart of the delivery of the central government policies and programs. Technoparks could be assigned to represent the interests of the central government's different departments within a single organization, making them uniquely well placed to take a cross-departmental approach, and provide a coherent view of the interactions and successes of government programs. That is why we think this system is similar to Regional Co-ordination Unit (RCU) and Government Office Network in the United Kingdom. Thus, they should promote the improved delivery of services that have cross-cutting outcomes and which make a real difference to regional people, ensuring coherence and adding value to the process through expertise and regional contact. That is, technoparks could be inter-departmental units located in the regions.

Furthermore, the government found that many departments of the central government invested so similar projects that they wasted the nation's budget. To correct these wrong practices and use the constrained region-related budget efficiently, the government decided to assign some of the central government's region-related budget to technoparks, which in turn use those budget on their own, based on their region's own needs and future plan. It also comes to realize that each technopark couldn't be the same as others and even as existing successful science parks in other countries in many ways because each technopark has its own unique conditions, in terms of industries and history. Up to now, they have been evaluated to be successful in setting up Regional Innovation System and in seating themselves on the position of regional innovation leaders.

Considering the significance and role of technoparks, technopark project is regarded as one of the most important means for regional technology innovation and balanced economic development. MOCIE called this project "Setting up Regional Innovation Governance System" and even assigned technoparks to the role of regional innovation hubs by revising the *1998 Special Act for supporting Industrial Technology Cluster (Technopark)* in 2007. To do these tasks successfully, technoparks aim to minimize bureaucracy and add value to delivery through shared experience and the best practices: bring together key stakeholders and regional partners and provide a high quality service by combining skills in the regional level with the co-ordination role in the central government in influencing policy design and implementation.

Hence, technoparks are asked to play such a similar role as Regional Co-ordination Unit or Regional Development Agency in the United Kingdom. In other words, since then, the major characteristics of technoparks have drastically changed to act as a catalyst for regional economic development or revitalization. Thus, it can be said that the present technoparks feature the economic geographical perspective, in which a science park is regarded as an entity consisting of specialized firms with an evolving structure of interfirm linkages and agglomerative effects, while Korean technoparks before President Roh took the institutional perspective. Thus, technoparks are asked to transform themselves toward a regional development agency which endeavors to respond to regional key stakeholders' expectations to work as a regional innovative hub. Now, Korea's 16 regionally based technoparks put enormous efforts to respond to regional key stakeholders' expectations to play their role as regional innovation hub with an affinity with its regional uniqueness. Mentioned earlier, GBTP also becomes a stronghold and a mechanism that enables industries, academia and research institutes in the region to actively exchange information. Toward this end, it provides a special meeting place such as Innovation Cafe where industry, academia and research centers can establish network centering on the Technopark of the region.

Playing to role of a catalyst and co-ordinator for regional economic development and innovation, Korean technoparks also need more inside efforts and outside supports to play a role of axis for

regional innovation hub and regional industry development. As seen in such successful role models as Silicon Valley, Hsinchu Science Park and Cambridge Science Park, it takes approximately 20 - 30 years for their full activation. Therefore, they haven't yet matured into self-sustaining technology parks and haven't gone beyond their boundaries to develop regional and global linkages. To play its role as hub of regional innovation and strategic means for the regional industry development in both name and reality, technoparks should be more supported by mid-long term strategies and well prepared legal systems.