

# Taedok Science Town and Regional Development : in terms of the Roles and Efforts of Universities and Research Institutes

Deog-Seong Oh  
Chungnam National University

## 1. Introduction

Recently, there has been growing interest in regional development policies that emphasize high technology and regional innovation. The emphasis on the stimulation of high-tech industry through technopolises and other initiatives by so many countries around the world is based on the assumption that technological innovation leads to economic growth (Simmie et. al, 1993).

The most important issues are how effective technopolis or Science Park can be as an instrument of regional innovation policy and for stimulating technology-led economic development.

It is argued that it usually take about 20-30 years after constructing science parks to commercialize the research results as spin-offs for regional economic development in the advanced countries (Massey, 1992). Previous analyses of the research institutes in TST and entrepreneurial activities in

the region concluded that there is no scientific network and synergy produced by the spatial agglomeration of research activities within Taedok. No milieu of innovation formed in the area and no linkage or feedback developed with manufacturing or application of any kind in the first two decades of its existence(Castells & Hall, 1994). Contrary to this perception, a few researchers recently found visible signs of the incidence of high-technology spin-offs indicating the possibility of high-technology entrepreneurship development in TST(Jeong, 1995; Kwon, 1997). In reality, TST also arrives at the time to have such powerful spin-off effects on the regional economy. Before 1990, however, TST has not had significant relationship with regional economy, and furthermore it was far from nurturing the high-tech based venture business. But, the situation is changing very rapidly after the Korean Advanced Institute of Science and Technology

(KAIST) opened the Technology Innovation Center (TIC) and the Technology Business Incubator (TBI) to stimulate commercialization of researchers' innovative research results from the beginning of 1990. There are several other approaches of Technology Transfer Infrastructure (TTI) like Technopark, and TBI to reinforce the weakness of technopolis program. In particular, Taejeon has been evaluated as one of the best location for the development of high-tech venture business in Korea because of the location of TST. With these considerations in mind, this study aims to analyze the role of TST for regional development in terms of university-research institutes- industry interaction. In particular, it focuses on the spin-off activities from research institutes and universities and their support mechanisms. This study consists of following three sections. Firstly, we describe the role and characteristics of research institutes and universities as the foundation of high technology business spin-off activities in the region. Secondly, the mechanisms for active technology transfer and business incubation are identified in terms of university-research institute and industry interaction in TST. Thirdly, important lessons for the development of technopolis are suggested from the view point of experiences of TST.

## 2. Overview of Taedok Science Town's Development

### 1) Backgrounds for the Development

The development of TST was strongly motivated by scientific considerations and regional development policy. In particular, TST is a vehicle for regional policy and the dispersal of economic activity away from the overcrowded capital region(Seoul) to medium-sized cities in peripheral regions. The technopolis program of TST has, therefore, been strongly dependent on government support to supply the necessary conditions for high-tech development(Oh and Kang, 1992). TST brings together many national and regional development policy efforts from the last 20 years. The plan represents a concerted attempt by the central government to create a Technopolis outside the capital region. In terms of national development plan, TST was an ad-hoc solution to three pressing problems; the over-concentration of population and industrial activities in the Seoul metropolitan area; bottlenecks in the application and admission process to first class universities, most of which are located in Seoul; and a common recognition that the era of heavy and chemical industry would be eclipsed in

the next decade and that existing facilities were inadequate for enabling Korea to catch up with the developed countries in advanced technological industries.

At the same time, the objectives of the TST development include: 1) creating a foundation for joining the ranks of advanced country in 21st century based on science and technology development, 2) fostering closer links among research institutes, academia and industry through the effective placement of government-supported research institutes, universities and private research institutes, and 3) establishing a pollution-free science garden city with cultural facilities. Especially it is expected that the TST can 1) enhance its research efficiency through a systematic and comprehensive R&D among each institute, 2) create an optimal research environment by mutual exchange and application of a variety of information, knowledge and know-how, and 3) promote investment effectiveness by its sharing of the facilities, manpower and projects. Establishing TST has been regarded as one way of maximum use of the limited R&D resources in Korea. Korea eventually intends to translate the TST into the main pillar or the Mecca of Korea's S&T development. However, the development of Korea's technopolis program is closely tied to central government priorities. The dominant

role of the government is particularly evident in the first phases of technopolis development(TST), which were established by a central government initiative<sup>1)</sup>. Local authorities were excluded from the initial planning of the technopolis program particularly in TST. Because of such a exclusion, there seems to be a lack of closer linkage between technopolis and regional industrial development.

## 2) Potential of TST as Engines of Taedok Science Town and Regional Development

Numerous studies including Castells & Hall(1994) have tried to make an assessment of technopoles across the world and yield a more mixed assessment of the potential of technopoles as engines of regional development. In their assessment, science cities which are new settlements, generally planned, and built by government, and aimed at generating scientific excellence by concentrating a critical mass of research organizations within a high-quality urban space, tend to have no direct linkages to local industry. They presented the evidence from the case studies of Tsukuba Science in Japan, and TST in Korea. However, there is a reason to expect that the incidence of high-technology spin-offs can occur in science cities when regional environments and

national conditions which and critical for the formation of new venture firms exist in the region. A few researchers recently found visible signs of the incidence of high-technology spin-offs indicating the possibility of high-technology entrepreneurship development in TST (Jeong, 1995; Kwon, 1997). If this is a reasonable expectation, It is then necessary to identify when and how the critical mass of research activities is formed, and important conditions affecting the incidence of research activities is formed, and important conditions affecting the incidence of high-technology spin-offs in a TST over time.

Since the early 1990s, the construction of TST is considered to be completed. However, there are several problems arising from the changing the expectations and environments around TST. In the original plan, TST was planned to play a role as a center of pure scientific advancement of Korea. However, recently applied research and development that are directly applicable to commercialization is highly expected from TST. Therefore, TST is criticised by being unable to fulfill such needs (Shin and Sul, 1999).

Although it is expected that technopolis development can encourage and facilitate the formation and growth of new business based upon the research knowledge, the volume of employment created by the development

of TST is not so much by international standards. Existing research institutions have 15,075 employees and the addition of 16 incoming Industry institutions in the near future, will provide another 3,000 direct jobs. However, considering the effect of direct job generation in high-tech and related service sectors, the impact of TST on the local economy should not be underestimated. In addition to direct job creation, we will discuss the positive roles of TST for regional development in terms of three aspects: 1) growth of research centers and R&D investment; 2) Interaction between research institutes, universities and local industries; 3) and Spin off's from research centers and universities.

### 3. Growth of R&D Activities in TST

#### 1) Growth of Research Centers

In terms of the major characteristics of R&D centers, there was an interesting change around 1990. Through large-scale government projects like EXPO '93 in Taejon and the relocation of the third central government headquarters from Seoul, the establishment of private R&D centers has been aggressively promoted. As of 1998, there are 59 private or public centers and 4 universities where 16,872 researchers and workers in TST.

Table 1. Status of R&amp;D Centers and Their Employee

Organization	In-town Organization		Organizations about to move into Town		Total	
	Number	Employee	Number	Employee	Number	Employee
Research Institute	50	14,170	16	584	66	14,754
-Government · Supported Institutes	16	7,199	-	-	16	7,199
- Industry Research Laboratories	26	4,103	16	584	42	4,687
-Government · Invested Institute	8	2,868	-	-	8	2,868
High Educational Institutions	4	2,215	1	215	5	2,430
Government Agencies	9	900	1	100	10	1,000
Grand Total	63	17,285	18	899	68	18,184

Source : Shin and Sul (1999), Long Term Development Strategies for Taeduck Science Town, STEPI 1999

There are 18 incoming R&D centers with 899 Employee in the near future. (See Table 1)

One of the reasonable indicators that measure the vitality of TST is a degree of R&D investment. Table 2 shows the size of private sector R&D investment from 1981 to 1996. Private research institute and the number of researchers in Korea were increased very high between 1986 and 1991, however private sector R&D investment and number of

researchers in TST were highly increased between 1991 and 1996. The growth rate of private sector R&D investment in TST between 1991 and 1996 is 296%. It is expected that these investment in private R&D will be continuously high through the location of 16 private R&D centers in the near future.

Table 2. Growth of Private Sector R&amp;D Institutes in TST and the Nation

Content \ Year	1981	1986	1991	1996	Growth rate (%)		
					81-86	86-91	91-96
Number of private sector R&D institutes <Nation>	3 <122>	3 <290>	5 <1,109>	25	0 <237>	166 <382>	500
Number of researchers <Nation>	1,390 <5,054>	1,390 <12,576>	1,666 <28,725>	4,475	0 <248>	119 <228>	268
Total investment in R&D (billion won) <Nation>	2,783 <3,424>	2,783 <8,521>	3,235 <22,640>	9,594	0 <246>	116 <265>	296

Source : Author's own survey

## 2) Interaction between Research Institutes and Local Industries

In terms of the growth of research centers and their role for the development of local industries, a major issue has been the interaction between public research and the scientific establishment on the one hand and private sector enterprises on the other, leading to joint R&D and spin-off firms

The Interview of the leading persons in TST to analyze the relationship between TST and regional economy (Oh and Kang, 1997), show us its positive role for the regional development. About 63% of interviewee mentioned that TST has a positive effect to the development of regional economy in Taejon and 89% of the interviewee answered that TST might have more positive effect in the future. Among the positive effect of which

TST possess to the development of economy in Taejon, employment (33.3%) was first in the hierarchy and next was use of research results (29.6%). It was revealed that 85.1% of research institutes in TST let construction companies in Taejon do repairment of facilities, extension or reconstruction of their buildings. There are, however, some problems to solve in terms of technology transfer. About 66.7% of the research institutes in TST say that research results of the TST are not so much contributed to the development of the companies that are located in Taejon City. Only one third of the R&D centers have regular connection with the firms in Taejon City in terms of collaborative research, technical supervision etc.

### 3) Spin-off's from Research Institutes and Universities in Taedok Science Town

High qualified research manpower in public and private R&D centers are highly concentrated in TST. This means that there is a high possibility of commercialization of research results or high-tech commodity from high-tech research in TST. It can be argued that there is a high potentiality in TST because there are about 2,000 Ph.D. degree holders. Recently active spinout motion from R&D centers is happening in TST.

Although several previous assessments indicated that the mere concentration of public and private research organization in a space cannot generate the incidence of high-technology spin-offs, the same type of organization in TST have been significant source of technology-oriented new ventures. According to Ko and Kim's research(Ko, S.C. and Kim, I.H., 1998), 9 organizations in TST together spun off 65 new high-technology firms until 1998. Among the nine parent organizations, only one is a private industry research institute and the others are government-related research organizations. This indicates that the public organization have played a vital role in the generation of high-technology spin-offs in Taedok.

The rapid growth of high-technology

spin-offs in TST since 1989 is likely to be caused by several reasons (Ko, 1998;Oh, 1998). The public research institutes like the Electronics and Tele-communications Research Institute made certain regulations on establishing venture firms by the employees since 1989, and started providing the start-up firms with venture funds. Second, the Central government supports the universities (KAIST or CNU) to establish Technology Transfer Infrastructure of Business Incubator to nurture new technological ventures by the employees and graduates in 1992. Third, the City of Taejon makes efforts to develop and support high tech firms particularly from TST. The high tech industrial park next to TST (1990), venture parks and SME's support centers are good examples of its efforts.

For the last 10 year 65 spin off companies from the R&D centers in TST have been found out in the survey of Taejon Metropolitan City. There were 3 cases of spin-off in TST in 1991, but it grew to 9 cases in 1995 and 20 cases in 1996. About 70% of business inauguration related with spin-off is happening in Taejon City during last four years. If spin-off effects of TST for the last 10 years are analyzed in terms of employment, 951 new jobs were created. If job creation of employment is analyzed in year base, 25 persons were employed in 1988, it grew up to 161 employees in 1991, and

Table 3. Spin-off Firms and Job Creation from the Technology Sources

year	88/89	90/91	92/93	94/95	96/97	98	Total
Number of Spin-off	1/1	2/3	6/3	7/9	20/9	4	65
Number of job creation	25/21	35/161	84/70	96/91	187/121	54	951

Source: Author's own survey.

employment in 1996 soared up to 189 persons.

65 spin-off companies were born from 9 public research institutes in TST as of July 1998. 27 spin-off firms were born from Korea Electric and Communication Institute. 11 spin-off Companies were created from KAIST and Korea Standard Science Research Institute each. These three institutes are the main bodies, where the active technology commercializations have been made. According to the survey results of these start-up firms, 80% of them have 5~10 engineers. All of them started the businesses with less than 200 thousand US \$.

However, the attitude of private research centers is not so open-minded for these active spin-off activities. Research results produced from TST are not allowed to be used by researchers who want to open their new business. There is very little spin-off company from private research institutes in TST so far. For example only 15% of research institutions in TST permit researchers using their research results, but about 52% of research institutes do not allow

researchers using their research results. If this climate is changed into the other way, business inauguration from TST might be much easier. This could mean that private research centers do not contribute much to regional economic development such as public research institutes do.

From the Ko's survey, the importance of specific regional attributes for the spin-off firms were also identified. The general image of the Taedok area was ranked highly as the most important regional attribute for the spin-off firm in TST. The easy access to technological information and the favorable atmosphere for the venture firms in the area were also ranked highly. The results from the survey suggest that the founders of the spin-offs in the area were influenced by a set of regional attributes. Recently the general mood in the city of Taejon and the province has been changing and they are making every efforts to set the linkage between the innovative capability in TST and the local industrial development(Ko, 1998).



Table 4. Research Institutes in TST and their Spin-off's

Name of research institute from which spin-off firms were born	Area of research, production, and activities	Number of spin-off firms
Korea Electric and Communication Institute	Development, supply, and expansion of information and communication skill	27
Korea Standard Science Research Institute	Establishment and distribution of national standard skill	11
Korea Advanced Institute of Science and Technology (KAIST)	University emphasized in Science and Technology	11
Korea Nuclear Institute	Development of skill in nuclear fuel	5
Korea Chemistry Research Institute	Creation of new materials and development of new production system	4
Military Science Research Institute	On-line diagnosis system of electric facilities	3
Life Science Research Institute	Expansion of research environment for life science	2
Korea Institute of Machine and Materials	Development of new skill for machine system in the field of transportation, environment and energy	1
Center for Artificial Satellite	Satellite development technology	1
Total		65

Source: Author's own survey

#### 4. Activities of University for Technopolis Development

##### 1) Basic Roles and their Impact for the Development

The conceptual discussion and evidence confirm Castells and Hall's (1994) observation that it takes a very

special kind of university, and a very special set of linkages to industrial and commercial development, for a university to be able to play the role of generating technopolis growth". The universities most likely to have those attributes possess R&D strengths that relate to the local economic base.

Other traditional functions of the university stimulate regional economic growth, notably human capital

formation and knowledge transfer. Through those mechanisms, universities help make the workforce more productive; attract to the region talented individuals, and retain local talent; and assist private businesses, governments, and NGOs to be more efficient. Because of those functions, and others such as capital investment, creation of a favorable milieu for business, co-production of knowledge infrastructure, and development of new products and processes universities are essential for technopolises to take root and grow. The more well-developed and appropriately tailored those activities, the greater the likelihood of technopolis development, all else equal. (Luger, 1997)

Luger (1997) classified the role of the universities for regional development into eight aspects. (1) The creation of new "basic" knowledge through research; (2) the creation of human capital through teaching (i.e., knowledge transfer from faculty to students); (3) the transfer of existing know how (i.e., technology) to businesses, governmental agencies, and other organizations; (4) the application of knowledge to the creation and commercialization of new products or processes, or the improvement of existing ones (i.e., technological innovation); (5) capital investment in the built-form and in the equity of private businesses; (6) leadership in addressing critical social

problems, (7) co-production of a knowledge-based infrastructure; and (8) the creation of a favorable "milieu."

Two national universities and one private college are located within the area of TST. They play a pivotal role in cultivating a highly specialized workforce, as well as pursuing the close linkage between research and education (MOST, 1996). In particular the CNU and KAIST show us the evidence of their impact on the regional development in terms of knowledge creation, human capital formation, technology transfer provision of regional leadership and knowledge infrastructure. The infusion of research fund into selected local economies creates a wave of additional spending in the region that is an important source of regional growth. The strong support to KAIST and CNU by government is regarded as the first of regional growth and knowledge creation by HEI's. The Knowledge transfer from faculty to students is regarded by many as the second of the two primary functions of research universities like KAIST or sometimes CNU. And from a regional development perspective, there is no single more important ingredient for sustained economic development that a supply of well-trained man powers. It can be estimated in TST that an economic impact to the region is realized when the increase in human capital leads to an increased stock of labor skill in the

region and then to increases in businesses' productivity.

The technology transfer role is combined with the teaching (and research) function. Administrators and faculty in both universities recognize that the local context can serve as a good laboratory for students to test the applicability of theory to real problems in engineering, the environment, planning, economic development, and other fields. Two universities, particularly CNU, provide the services institutionally by such organizations as industrial extension services, small business assistance centers, business schools, economic and business research bureaus, medical clinics, or by individual faculty through consulting. The range of programs for technology transfer in both universities includes industrial liaison programs, centers for advanced technology, and joint university-industry research projects.

## 2) Different Activities of Universities for Regional Development

The different roles of the two universities in TST are interesting in respect of high-tech development of technopolis. CNU plays an intermediary role between the research centers in TST and the local industries in Taejon, because its position in the city is secure as a locally-based national university

with a variety of faculties. For example, it has since developed several programs for close collaboration with research institutes in TST as well as industries in Taejon City. These collaboration programs with the R&D centers in TST include the exchange of staff and co-operative research. The university faculty and post-graduate students assist the industrial labs and institutes through consulting and research, at the same time researchers in TST supervise post-graduate students, as the university offers them the status of visiting professor. The university has also been keen to initiate adult education and night courses that would strengthen university-industry links, particularly with the industries in Taejon city (Oh, 1995).

On the other hand, KAIST focuses on research activities and has closer linkages with the research centers in TST as well as those in the whole country. MOST (Ministry of Science and Technology) is the major sponsor of its research activities, and it also has strong links with the government institutes and the research labs of private firms through the indirect support of central government. The incoming private firms have evaluated the location of KAIST as the most crucial location factor, and recruitment of graduates from the university is one of the main considerations in their decision to settle in the area (Oh, 1995)

### 3) University Organizations for Supporting Technology Transfer and Spin-off's (Technology Transfer Infrastructure)

There is, on the other hand, the high potential in Taejon City in terms of business incubation and collaboration between universities and industries. TTIs play a critical role to transfer the technologies from HEIs and research institutes to technology users. TTIs are those organizations such as BIs (Business Incubators), TBIs and TICs that transfer technologies from the sources to users and execute many works in behalf of users.

There are three types of TTIs such as TBI, TIC, and Consulting Center for Technology Development, in KAIST. The major tasks of TBI are supporting the technology spin off from the research institutes in TST. Targets of support are SMEs that are highly related to government support research institutes in TST. The main function of TIC is to accelerate of technology innovation by providing research results from KAIST to start-up firms and to support venture business firms by transferring technologies of KAIST. Consulting center for technology center support the technology innovation of private firms by the establishment of nation-wide technology utilization system. This center utilizes information, know-how, research outputs which are

accumulated to government invested research institutes and researchers and research facilities. This center approaches a systematic way like managing a one-stop service center and follow-ups for the technology consulting<sup>2)</sup>.

There are also 3 TTIs such as, BI, Regional Research Center of Software, and Rental Research Institutes for the private firms in CNU. The major tasks of BI in Chungnam are supporting the business start-ups by providing a variety of services related to inaugurating the firms, renting work space with moderate price and relocating the start-up SMEs and prospective start-up firms into the BI<sup>3)</sup>. The major works of Rental Research Institute (RRI) are investing large and medium size firms into the RRI and promoting the joint researches between the universities, research institutes and firms and supporting the rented firms by let them use research facilities and labs in CNU. Target firms of the RRI are those who want to do joint researches between firms and universities in the field of new materials. In the RRC, the major tasks are development of core software by the consecution composed of universities, research institutes and firms related with computer software and transferring the software technology to the local firms and providing the instruction about the off-the-short technologies. Any research institute and firm interested in software

Table 5. TTIs of the Universities in TST

TTIs	University where TTIs belong	Major tasks
TBI/BI	- KAIST	· Strengthening the linkage between the universities, Research institutes and firms
	- Chungnam National University	· Fostering the preliminary firms at the business Incubator
TIC	- KAIST	· Acceleration of technology commercialization through the transfer of technologies from TST
Regional Research Center	- Chungnam National University	· Development of core software and transferring Software technologies to local firms
Rental Research Institute	- Chungnam National University	· Renting work space with moderate price and providing Variety of services related to business start-up

Source : Author's own survey

development are welcomed to locate in Software Research Institute.

In addition, there are 5 organizations that have established or are establishing the TTIs with business incubators. In total, there are 330 tenant units for high tech venture business until 1999. With this supporting organizations and TBI facilities, business inauguration is becoming relatively active in Taejon compared with other cities in Korea. According to the annual report of Taejon City (1998), there are 230 tenant units of business incubators in 1998 and 100 units will be added in 1999.

It is expected that scientific entrepreneurs from universities or R&D centers in TST will mature at these centers to the point where they can graduate from

the incubator and continue their development as viable enterprises. These figures tell us something about the university-based incubator or technopark and their possible utility to the local community as tool for enhancing economic development.

## 5. Conclusion

In this paper, technopolis and its role for the sustainable regional development has been evaluated with particular reference to TST. There are several important findings from TST's experience, which are crucial to the future development of technopolis. These are the different roles of

universities and research institutes in terms of the regional development through active spin-off activities and academic and industrial collaborations. The universities in TST play pivotal role for technopolis development in terms of knowledge creation, human capital formation, technology transfer provision of regional leadership and knowledge infrastructure. These are almost certainly essential backgrounds for the development of technopolis. High concentration of high-qualified manpower in R&D Centers also means that there is a high possibility of commercialization of research results or high technology commodity from high-tech research in TST. The active spin off from TST for last ten years can be the good evidence of technopolis impact for regional economic development.

On the other hand, there are efforts of universities and local government to create business incubators and technological and financial support mechanism to maximize the opportunities for technology transfer between academic and research facilities and private firms. In particular, the experience of TST shows how university-linked organization for technology transfer can promote their development

There is also the activity for local initiatives to reinforce technology-led economic development. Their efforts

focus on attracting high-tech industries and establishing promotional organizations. The establishment of industrial parks (Technopark) where R&D activities can be promoted and commercialized makes sense in this respect. Even the study identified that technological spin-offs and several action programs for technological transfer in TST are in a fever, relationship between TST and regional economy has not reached a sufficient level. One of the major reasons of the weak relationship is that Taejon has not developed a strong linking mechanism, which is largely composed of action programs, that combines each resource of research institutes, universities, and a community. More importantly, the action programs will act as a window for TST, universities, and a community including business society seeking to commercialize research results and relate commercialization of research results to vitalization of regional economy. In order to foster regional economy via commercialization of TST research results, more designated linking programs combining the sectors should be developed.

## Notes

- 1) Designated technopolis sites are eligible for limited financial assistance from the government in connection with their planning costs. The government also

provides indirect financial support for technopolis development through industrial relocation incentives and the construction of infrastructure such as roads, highways connecting to the sites, and housing estates and urban facilities undertaken by the Land Development Agency (Oh, 1995).

- 2) From 1994, new technology-oriented venture firms started moving in the KAIST TIC/TBI. The KAIST-TIC/TBI was restructured and renamed as the High-Tech Venture Center. Currently, 29 start-up companies in HTVC are sharing space, facilities, equipment, technical information, and various services such as financing, patent, management skills, etc. HTVC also provides education and training programs to enhance the knowledge and experience of participating entrepreneurs.
- 3) Now, 6 start up firm are operating their activities in CNU and 40 venture businesses are preparing their business in CNU from August 1998.

## References

- Castalls, M. and Peter Hall, 1994, *Technopoles of the World*, London: Routledge.
- Grason, L., 1993, *Science Park: An Experiment in High Technology Transfer*, London: the British Library.
- Jeong, J. H., 1995, *Linkages in Taedok Research Park's Research Institutes and Spin-Offs Formation*, Unpublished master's thesis, Department of Geography, Seoul National University.
- Kim, Y. W., 1991, *Organization and Industrial Linkage in developing Countries: LA Case Study of Less Industrialized Region in Korea*, Ph.D Dissertation, University of Sheffield, U.K.
- Ko, S. C. and Kim, I. H., 1998, "The Incidence of High Technology Spin-Offs and Innovative Milieu: the Case of Taedok Science Town, Korea", *Proceeding of WTA Conference, Taejon, Korea*, pp.167-189.
- Kwon, Y. S., 1997, "The Spatial Distribution and Regional Differences of Industrial Innovation in Korea", *국토연구*, vol. 26, pp.55-71.
- Luger, M., 1997, "Universities and Technopolis Development", *Proceeding of WTA Conference, Taejon, Korea*, pp.271-296.
- Lin, Chien-yuan, 1996, "Technopolis Development : An Assessment of Hsinchu Experience", *The Research Review of Regional Development*, 8, pp.371-390, Regional Development Research Institute Chungnam National University, Taejon(Korea).
- Masser, I., 1990, "Technology and Regional Development Policy: A Review of Japanese Technopolis Program", *Regional Studies*, 24, pp.41-53.
- Massey K., Quintas P., Wield D., 1992, *High-tech Fantasies*, London: Routledge.
- MOST(Ministry of Science Town and Technology), 1989, *The Basic Plan of Technobelt in Korea*, MOST, Seoul(in Korea).
- Oh, D. S. and Kang B.J., 1997, "The Evaluation of Technopolis Development in Korea", *Proceeding of Techno 'Conference 97', St. Petersburg, Russia*.
- Oh, D. S., 1995, "High Technology and Regional Development Policy: An Evaluation of Korea's Technopolis Program", *Habitat International*, Vol.19(3), pp.253-268.
- Oh, D. S. and Kang, B.J., 1998, "Networking the Technology Sources and Technology Transfer Infrastructures", *Proceeding of WTA Conference, Taejon, Korea*, pp.21-47.
- Oh, D. S. and I. Masser et al, 1995, "Technological Change, Economic Development and Space", *Springer, Germany*, pp.295-333.
- Oh, D. S. and Kang, B.S., 1992, "Development of Taedok Science Town: Strategies for the Business Incubation", *Proceedings of International Symposium on Development Strategies of Science Towns, KOSEF*,

*Taejon*, pp.51-76.

Sin, Dong-ho et al, 1999, *Long-term Development Strategies for the Taedok Science Town, Korea*, STEPI, Korea.

Similor, R. et al, 1988, *Creating the Technopolis*, Cambridge, MA, USA: Ballinger.

Simmie J., Cohen J., Hart D., 1993, "Technopole Planning in Britain, Ireland and France", *working paper 6*, Planning and Development Research Centre, University College, London

TSO (Ministry of Science and Technology), 1996, *Taedok Science Town*, Information Paper, Taejon, Korea.

Wessel, K., 1991, *Raumstrukturelle Veraenderung im Entwicklungsprozess Suedkoreas*, Hannover, Germany: Hoeller und Zwick.

## ABSTRACT

This study aims to analyze the role of TST for regional development in terms of university-research institutes-industry interaction. In particular, it focuses on the spin-off activities from research institutes and universities and their support mechanisms. This study consists of following three sections. Firstly, we describe the role and characteristics of research institutes and universities as the foundation of high technology business spin-off activities in the region. Secondly, the mechanisms for active technology transfer and business incubation are identified in terms of university-research institute and industry interaction in TST. Thirdly, important lessons for the development of technopolis are suggested from the view point of experiences of TST.

Key Words : Taedok Science Town(TST), R&D, interaction, spin-off, regional development