1. INTRODUCTION

To construct an industrial complex is a very important policy on regional development in an industrial society. Since 1960s, the Republic of Korea has accomplished rapid economic growth through swift industrialization and concentrated policy on industry development focused on manufacturing industry during which large numbers of industrial complexes were widely constructed throughout the nation. At the beginning of industrialization, to construct large scaled industrial complex was demanded in specific areas in order to make effective use of insufficient resources for economic growth and to increase efficiency in the process of integrating production capability (Park, 2014)\textsuperscript{1}.

\textsuperscript{1} In processing industrialization, industrial facilities were excessively concentrated in specific areas and social problems to hinder the balanced development between regions were caused. A problem of over-population in capital city where industrial facilities were concentrated and an issue of regional unbalanced development such as population outflow and decline of regions due to depression of industrial activities in regions falling behind were raised.
The construction of medium and small scaled industrial complexes, and of high-technology industrial complex rather than large scaled ones was proceeded in accordance with a policy on industrial acceleration after 1980s. But this endeavor reached limit in inducing regional industrial development and in taking effect on economic growth except in the specific regions. This phenomenon resulted from being the lack of strategy for fostering high-technology industry.

Therefore, since 1990s, a strategy for establishing innovation system based on industry-academia cooperation rather than for merely developing industrial infrastructure has been proceeded. Along with infrastructure development, the policies of preparing a platform for technical innovation by expanding research development, of reorganizing industrial structure by promoting business start-up and technology transfer, and of strengthening industrial competitiveness by fostering strategic industry of region were proceeded. To achieve these, ‘Techno-Park’ (TP) was established with participation of universities, research institutes, central and local government. As a hub of regional innovation system, TP performs a role in promoting the knowledge-based industry by strengthening enterprises support for enterprises.

Technology Park performs the nation’s exemplary development strategy for the region to advance innovation growth thanks to the recognition that strengthening innovation growth such as creation of knowledge and information, and development of new technology becomes a basis of the region’s industrial competitiveness. It means that a strategy for growing capital and labor intensive industry in society of knowledge and information reached the limit, and that innovation strategy for knowledge-capital focused industry on foundation of human capital, advanced technology and knowledge production is in need (Ahn et al., 2007).

The period of rapid economic growth when constructing industrial complex would bring about inviting enterprises and creating employment is not likely to come again. In order for a city to steadily develop, it demands competitiveness based on innovation growth, upon which a policy of promoting sustainable industrial development and economic growth. Furthermore, the platform for starting up business and sustainable growth should be prepared in this society of knowledge and information.

The new administrative capital city, Sejong, also has this burden. At early 2000s, the new city was built to transfer administrative function of the nation from Seoul aiming at balanced regional development. Sejong city has grown with two hundred thousand population, which has a problem of insufficient power to drive urban growth except for having central government organizations. The next development strategy chosen to be a sustainable growing city is to have plans for establishing infrastructure and cooperation system upon which it intends to promote knowledge-based industry and to advance the economic growth.

Accordingly, this paper reviews main contents of the development plan for ‘Tech-Valley’ project which Sejong city is proceeding to establish advanced technology infrastructure and innovation system as a strategy for sustainable development of new administrative capital of the nation. This paper would be able to suggest an issue to the region which is considering to build innovation infrastructure and system.

2. ENDOGENOUS DEVELOPMENT AND REGIONAL INNOVATION

The endogenous development means a strategy for regional development for a sustainable growing base by overcoming the limit of regional internal resources and by strengthening regional innovation capacity (Lee and Oh, 2016; Jang, n.d.). This is a symmetrical concept to ‘exogenous development’ concept which includes building industrial complex to invite enterprises for regional growth through their economic activities or constructing national infrastructure as a basis of the regional development (Park, 1999). This concept does not refer to the development depending on purely regional resources and capacity excluding external assistance, but to a definition in which innovative participants play leading roles in reinforcing capability and in pursuing innovation by dint of investment and support from outside of the region.

Generally, the exogenous regional development strategy was used by virtue of the outside support. Thanks to supports from the central government, a growth engine for regional de-

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² The cooperation between universities and enterprises was reinforced and ‘science park’ was built for the establishment of regional innovation system to actively overcome world-wide change of production system from mass production into small quantity batch production since 1970s (Kwon and Byeon, 2003).
velopment power was secured which resulted to constructing lower infrastructure, and inviting enterprises and production facilities from outside of the region. However, the exogenous regional development strategy failed to build a foundation of fostering industry for a sustainable regional development and revealed numbers of problems of reaching the limit in regional growth due to insufficient competitiveness, while it contributed to regional economic growth to a certain level (Lee and Oh, 2016). The reasons why the exogenous regional development strategy showed the limit of regional development could be summarized as below (Seo, n.d.).

- The enterprises invited and developed in the region give priority of profit to the holding company
- To have difficulty in cooperating with regional industry and enterprise due to preferring having business within subsidiary companies
- Not to contribute to expanding and reproducing regional economy as profits are flowed out to the city where the holding company is located
- To have tendency to neglect social responsibility for employment and environment in the region
- To have difficulty in inducing enterprises in accordance with local government’s plan as they are private companies invited from outside of the region.

To overcome the limit of the exogenous regional development strategy and to promote the sustainable regional development, the endogenous development policy which would strengthen regional power enough to create innovation as preparing a platform for development started to draw attention. Enterprises became to have tendency to select location of industry where would acquire more regional competitiveness regardless of geographical limitation under conditions of expansion of knowledge-based economy, acceleration of science technology such as IT, BT, NT and spread of globalization. Accordingly, the regional development policy has been changed its direction into constructing innovation infrastructure to reinforce innovation growth and preparing a platform for the regional development in close cooperation between innovation actors.

Regional innovation means the creation and spread of regional development capacity depending on the condition and characteristic of the region in the field of human resource, science technology, industrial production and support for enterprises. Regional innovation system indicates a support system to connect activities among universities, enterprises, research institutions, local governments and nonprofit organizations, and to promote their cooperation. It could be understood as an autonomous network or a governance in which innovation actors are horizontally combined and they promote the endogenous development in the region (Lee and Kim, 2007).

As it is mentioned above, while constructing physical infrastructure was outweighed for the regional economic growth in the past, it becomes the more important task to establish innovation ecosystem which enable innovation-based growth as well as to construct the physical infrastructure. Furthermore, building innovation system\(^3\) has a significance to prepare a platform based on the close cooperation between industry, university and government for the regional industrial development in knowledge-based economy (Lee and Oh, 2016). For this reason, it needs to construct Science and Technology Park, (STP) to foster knowledge-based industry and to build innovation system. In addition, based on industry-academia-government cooperation, development policies are being promoted to strengthen the regional innovation capacity, and to create an innovative ecosystem so that it can make a sustain innovation on the basis of it.

3. OVERVIEW OF THE PROJECT

3.1 Background and necessity of developing Sejong Techno-Valley

The new administrative capital of the Republic of Korea, Sejong city, has been constructed to improve on overpopulation of capital by relocating administrative organizations of the central government and by distributing functions of the capital, and to promote balanced development of regions. Sejong Special Self-Governing City (Sejong city) was launched in July, 2012 with a hundred thousand population while merging regions around the new city.

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\(^3\) The regional innovation system (RIS) needs to be established in which various innovation actors such as local governments, universities, enterprises and research institutions can closely cooperate one another through joint research and creation of innovation. The key factor of the successful regional innovation results from forming close network among universities, enterprises, local and regional governments, and local resident also (Lee and Kim, 2007).
The 1st stage of Sejong’s development started with transferring 16 central administrative organizations and 20 affiliated institutions since 2012. The city has grown with twenty-two hundred thousand population as of February, 2016 as living condition gradually expanded thanks to consistent inflow of population. Additionally, it is developed as an administrative city which performs the truly nation’s central administrative function by constructing National Research Complex and transferring 12 National Research Institutions. However, for a city’s sustainable development, the self-sufficient functioning and the assurance of growth engine to support economic development are in need because only transferring administrative organizations is not enough to secure its sustainable development.

On the basis of recognition that a platform for fostering hi-tech industry should be prepared for the city’s sustainable development, Sejong city makes the plan to create innovative environment by constructing industrial complex, inviting universities which would foster human resources, and improving living condition and cultural facilities for the quality of life. In the early days of city development, the construction of hi-Tech industrial complex was outweighed in order to invite large corporations and advanced companies as a leading function of growth. Meanwhile, it was asserted that a plan to construct innovation infrastructure is in need to encourage inviting enterprises and starting-up businesses, and to promote balanced development and economic growth rather than a policy for constructing industrial complexes for business activities for the new city’s sustainable development.

Establishing the regional Innovation System to invite outstanding universities and to construct Advanced Technological Infrastructure was presented as a solution for city’s sustainable development accordingly. The plan was set up to build a cluster for university-centered industry-academia-government cooperation. The summary of plan is as below.

- To invite the research-oriented universities and research institutes and to construct the research park
- To establish joint-campus based on characterization
- To construct infrastructure for fostering venture companies
- To establish support organization for regional innovation system and to form a network to cooperate

3.2 Basic Planning Concept of Sejong Tech-Valley

Through strengthening capacity of innovation actors such as universities, research institutes, companies, and local governments and to establish regional innovation system (RIS) as well as networking and promoting mutual learning among in-
novative actors, Sejong city plans to form a cluster around specialized universities and to make such cluster a key source of growth for the city.

If the urban growth (1st stage of growth) is the result of external factors caused by establishment of urban development projects, special laws led by the central government and transfer of administrative agency, future urban growth (2nd stage of growth) is based on the strategy to strengthen regional innovation capacity to drive regional endogenous development. In order to take charge of technological innovation through human resource development and R&D as a basis of sustainable growth, it had been adopted as a urban development strategy to attract research-oriented universities, research institutes, and innovative companies (hidden champions), and to create the innovation based on close cooperation between them. Although this plan is to form a basis for urban growth by attracting innovative institutions from the outside, it is an urban growth strategy in which does not simply find driving force from the outside, but establishes infrastructure and support system for innovative system so that innovations can be made continuously.

Therefore, it is a strategic approach that is not simply a plan to create industrial complex to induce hi-tech enterprises and institutions, but to establish advanced technology infrastructure and system for creating innovation and to support their activity, and to prepare a basis for innovation by continuously developing human resource. For such reason, even though receiving external support from universities, research facilities and corporation is an important issue, it is an endogenous growth plan rather than an exogenous plan.

In order to build an innovation system based on cooperation among innovation actors and to grow into an innovation cluster, NAACC has set up the constituents and their roles from the perspective of forming an innovation cluster from the beginning of the plan. In order to build a dynamic innovation cluster that creates continuous competition and cooperation, it is necessary to have a dynamic competitive structure, an easy access environment for universities and research institutes, and a variety of high-quality specialized productive facilities. It is also essential to establish a cooperative system of innovative cluster environments like a strong cooperation system linking organizations and related industries capable of promoting commercialization of advanced new technologies (Kang and Oh, 2010). Accordingly, the role of the innovation

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5 An innovative cluster indicates spatial concentration of industry which sustains innovation and renovation continuously through close cooperation between constituents to develop technology-based industry by creating, utilizing and expanding knowledge.

6 National Agency for Administrative City Construction (NAACC): Established in 2006, this agency is managing and overseeing the development of the new administrative city, Sejong.
cluster is divided into the vision provider (VP), system organizer (SO), specialized supplier (SS), and network accelerator (NA) to establish innovative system, and the components were set up.

First of all, a model was set up in which university and corporate research facility takes charge as vision provider (VP), high-technology hidden champion performs the role of system organizer (SO), and venture enterprise, knowledge industry center, and research core performs the role of specialized supplier (SS). In order to establish innovation cluster in especially in Sejong, the role of universities is the most important as the vision provider. Therefore, each university needs to share vision of cluster and to build a joint-campus to create organic collaboration to prepare the foundation for characterization. It is necessary to establish an advanced technology infrastructure so that each function and role of each constituent subject can be successfully performed. The following table shows the summary of each constituent’s role.

The main components of the innovation cluster to be built through Tech-Valley project will be the universities and research institutes for vision provider (VP), the hidden champion companies for system organizer (SO), venture companies and support service organizations for specialized suppliers (SS).

Universities will provide infrastructure for R&D facilities, technology commercialization center and incubation center. Such infrastructures will perform the function of R&D for basic and applied technology, of industry-academia R&D collaboration, and of fostering excellent human resources. Research insti-

Table 1. Components and their roles of Sejong innovation cluster

<table>
<thead>
<tr>
<th>Role</th>
<th>Constituent subject</th>
<th>Function</th>
<th>Main infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision Provider (VP)</td>
<td>- University: KAIST, Korea University, and 3 other national universities</td>
<td>- To provide direction for industrial development through basic research and applied research.</td>
<td>- Creative campus town</td>
</tr>
<tr>
<td></td>
<td>- Research center: Corporate research facility</td>
<td>- To foster research personnel and facilitating technology commercialization through industry-academy cooperation</td>
<td>- Industry-academia collaboration complex</td>
</tr>
<tr>
<td>System Organizer (SO)</td>
<td>- Hi-Tech hidden champion corporation</td>
<td>- Technology commercialization</td>
<td>- 1st stage: Industry-academia collaboration complex</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Development of new technology and activation of cooperative networking for maximization of efficiency.</td>
<td>- 2nd stage: Establishment of venture park and revitalization of existing industrial complex.</td>
</tr>
<tr>
<td>Specialized Supplier (SS)</td>
<td>- Venture companies</td>
<td>- To provide parts and specialized technology for completion of product.</td>
<td>- Development of infrastructure for research core.</td>
</tr>
<tr>
<td></td>
<td>- Knowledge support industry center and Research core.</td>
<td>- To provide support for companies.</td>
<td></td>
</tr>
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</table>

source: MACCA (2014)

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7 Vision Provider (VP): to suggest vision, direct goal of industry and to develop basic necessary technology
8 System Organizer (SO): to play role in materialize vision suggested by VP, commercialize technology developed by VP and to vitalize cooperation network between constituents
9 Specialized Supplier (SS): to supply parts and professional specific technology for completion of goods, support service for enterprise such as marketing, finance, law for market development
10 Networking Accelerator (NA): to induce innovation by activating cooperation between constituents of innovative cluster
tutes along with universities will provide infrastructures related to R&D and technology commercialization, and perform the role of strengthening capacity on development of applied technology with basic technology. It will also take the role of fostering research personnels in connection with universities.

Hidden champion will carry out technology commercialization based on collaboration with universities and research facilities as well as establish cluster ecosystem, find cooperative business, provide mentoring support for start-up and provide new jobs, so that it should perform the role of driving local economy growth. Specialized service company will provide specialized support and service for companies in terms of legal, finance and marketing, while research core will perform networking function for activating interaction among cluster subject constituents.

In order for each university to perform the role of vision provider (VP) effectively, vision regarding establishment of cluster needs to be shared, collaborative R&D in specialized area needs to be expanded, excellent personnel need to be fostered, and innovative activities such as technology commercialization and start-up based on close cooperation need to be strengthened. To foster specialized industry by facilitating such universities’ cooperative activities, NAACC intends to establish a joint campus and integrate specialized universities to perform the role of improving the quality of education and research environment.

4. MAIN CONTENTS OF SEJONG TECH-VALLEY PROJECT

4.1 Major Functions and Development Plan

Main goal of Tech Valley Project is to foster this area into regional innovation hub by developing infrastructures along with attracting companies, universities and research institutes and to grow into innovative cluster. Through this development project, main functions consists of universities, science park, campus town and campus support facilities. The ‘university area’ consists of research-oriented universities and a joint-campus, and the ‘campus town’ consists of commercial facilities, neighborhood living facilities and housing for residents. ‘Campus support facilities’ area consists of student union center, dormitory, gym and cultural facilities. ‘Science Park’ area consists of research parks, research cores and venture parks.

University area: Universities and joint campus

Universities that will be attracted at Tech-Valley Project consists of three campuses for research-oriented university and a joint-campus based on the specialization. Research-oriented university will perform the role of fostering excellent human resources through basic research and industry-academia collaboration. Along with this, joint-campus is a new kind of uni-
University model, which aims to provide local specialization basis to bring universities with each of their own specialization into one campus, to improve the quality by sharing education and research programs among universities, and to maximize efficiency by sharing joint library, student union center and lecture hall. In other words, it is expected to increase the efficiency of operation by setting up specialization fields that can be operated jointly and using facilities jointly. It is also expected that it will play a role of accelerating education and research activities by expanding support. Additionally, it is expected that not only the common use of infrastructure but also the strengthening of industry-academia collaboration and enterprise support activities such as research and development (R&D), business incubation and enterprise support service. The main functions of this area would be facilities for education, research and industry-academia cooperation such as university campus, joint campus, university specialization center, cooperation support center for industry-academia activity and human resource development center.

Campus town
As a facility required to make a creative university campus environment, facilities for the convenience of students, researchers, and their families who are using universities and science parks are provided.

Campus town will consist of university town center, a commercial business facility, neighborhood facilities and houses. Particularly, rental houses that hold 1000 households will be built for university students, professors, researchers and workers of tenant companies.

Campus support facilities
Campus support facilities will consist of student union center, library and Fab Lab as the function to support universities’ activities for specialization, education and research. Also, dormitory, guesthouse, recreation center, cultural facilities, museum and exhibition center will be built as residential support facilities.

Science Park
Science Park will consist of research park, research core and venture park. Research park will be composed of national and corporate research institutes related to Nano and bio industry to gain synergy effect with international science business belt (ISBB) that will be developed near the area. Research core will serve as the key role of connecting universities and science park within the cluster. Also, it will have the knowledge-based industry center and industry-academy cooperation facility such as SB plaza\(^1\), start-up center, technology commercialization center, etc.

\(^1\) Science and Business Plaza
4.2 Industry-academy cooperation system

In planning the Tech-Valley project, NAACC set its goal of determining the specialized industry sector and fostering it strategically. The regional characteristics of Tech-Valley are what is located near the advanced industrial complexes and innovative infrastructures such as Daedeok innovation cluster based on Daedeok Science Town, Osong Bio-valley, Ochang Scientific Industrial Complex. In addition, International Science Business Belt (ISBB) with a heavy ion accelerator for capacity building of basic science is being developed in the adjacent Daedeok special R&D zone. Also, considering these regional characteristics, bio technology (BT) industry centered on medical science and biomedical science has been selected as a core industry, and IT convergence technology sector has been selected as a supporting function.

For such purpose, research-oriented universities and the joint campus\(^1\) which will play a central role in industry-academia-government cooperation in the BT field, will be the core subject for the specialization among the various functions in Tech Valley.

Universities will contribute towards building a virtuous cycle structure of city development through fostering talented human resources, and joint campus will be able to provide specialized basis of local industry to contribute to the formation and growth of the cluster, which will add to industrial growth of the area. Also, universities can create a joint program that can connect industry and education to reinforce capacity of education and research, and to expand industry-academia cooperative activity so that will perform the core role of creation of regional innovation. Such joint program can avoid redundancy in selecting strategic industries with the surrounding areas through careful selection and focus, and it can be a specialized strategy to grow into the regional innovation cluster in a long term perspective.

The cooperative system will be made between universities with competency in BT and research institutes in research park. The research core will play a role in strengthening cooperation and expanding support activities on technology commercialization and technology cooperation, so that will lay the groundwork for innovation in the venture parks and sur-

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\(^{1}\) The role of the university as the Vision Provider (VP) of Sejong Tech Valley is the most important. In order to enable each university to share the vision of Sejong Tech Valley, creating joint campus can be a core strategy.
rounding industrial complexes to promote business activity. The collaborative research activities in the Tech Valley are not confined within this region but can be expanded through cooperative network with research institutes, universities and corporations in Daedeok. It will also contribute to the industrial development of the industrial complexes area as well as the Tech Valley area by activating activities for research cooperation and expanding support to increase start-up, technology commercialization and technology transfer activities. These activities will eventually contribute to building a virtuous cycle structure that fosters ‘hidden-champion’ enterprises and establishes a foundation for attracting foreign companies by expanding the area of the bio-cluster centered on Daedeok Science Town to Sejong City.

5. SUMMARY

The strategy that the new administrative capital, Sejong city selected for sustainable growth of city is not only to develop the infrastructure for attracting universities, research institutes and high-technology companies but to make innovation system by building cooperation system for the further consistent innovation.

 Preferentially, for realizing these goals and laying the foundation for continuous innovation, policy on attracting research-oriented universities for excellent R&D and nurturing advanced human resources was pursued, and three research-oriented universities are preparing to construct campuses. In addition, it was demanded to take measure for base to foster the regional strategic industry. And in order to lay a foundation for specialization of regional industry, a policy to strengthen regional innovation capacity was promoted as universities share the program and facilities on education, research and industry-academia cooperation jointly. Accordingly, universities expect to improve efficiency and quality of program on education and research by jointly establishing campus infrastructures and jointly developing and managing cooperative programs. This joint project will contribute to the promotion of excellent human resources development and technology development activities and further activation of
research institutes and excellent enterprises in the region.

The Tech-Valley project consists largely of research-oriented universities, joint campus and science park. Science park is divided up into research park where research institutions moved in, research core which consists of support facilities for industry-academia cooperation and for enterprises, and venture park in detail. Based on the close collaboration of these functions, the university-centered cooperation system will be established so that the Tech-Valley can grow into an innovation cluster. Research cores which include enterprise support center, technology commercialization center, and incubation centers, take a role in promoting industry-academia-government cooperation activities.

Broadly, it will contribute to the development of innovation cluster center on Daedeok special R&D zone by expanding joint program on research cooperation and supporting enterprises with International Science Business Belt (ISBB) and Osong Bio-valley.

Especially, this project will contribute to foster regional strategic industry and to strengthen cooperative network system in this region through cooperative activities on the field of characterization, Bio-technology and complementing advanced innovation infrastructure.

The Techno-Valley project which the new city opted for the sustainable development is not exogenous development strategy depending on the support from outside of the region, but endogenous one to lay the foundation for sustainable development by strengthening internal capacity along with external support. In particular, building the regional innovation system will be a key program of sustainable development strategy on strengthening industry-academia cooperation and promoting start-up business, technology commercialization and enterprise support.

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