I. INTRODUCTION

South Korea’s major state policies in the early 2000s can be summarized as decentralization and the balanced development of the country. Away from the country’s traditional development strategy focused on Seoul and its metropolitan area, the government launched policies to promote balanced development across the country. Accordingly, Sejong City was planned as the country’s new administrative capital with central administrative organizations and other related organizations, and for sustainable economic growth based on innovative industries, universities, and research institutes.

In order to develop Sejong city as a new administrative capital, the government embarked in 2004 on the process of revis-

Development of a Joint University Campus as a Key Element in the Regional Innovation System in Sejong Tech Valley, South Korea

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Abstract

Sejong City, which has been chosen as a new administrative capital of South Korea, has completed the first phase of its development plan with the construction of the facilities needed to accommodate central administrative organizations and the required accompanying population. Now, it is undergoing the second phase of development with a focus on strengthening the region’s innovation capacity to catalyze endogenous development. The strategy for phase II is to establish a regional innovation system including building necessary infrastructure and attracting innovation agents such as universities, businesses, and research institutes. The first step for this is developing a research complex, tentatively named Tech Valley, that includes universities, research institutes, and businesses, and building infrastructure comprising a science complex, a knowledge industry center, and support facilities. Phase II of the city’s development initiative includes the establishment of a joint university campus, which is to serve as a center to promote cooperation among industry actors, universities, and research institutes. The concept of a joint campus has been drawn from a need to enhance capacity for innovation and specialization in the region’s industries and to maximize synergy among participating universities through the sharing of research equipment, facilities, and programs. The joint campus is expected to play a key role in creating an innovation system in the region by enhancing research capacity for strategic industries, cultivating highly skilled human resources, and leading industry-academia-research cooperation. In order to ensure the sustainable development of the new city, there is a growing need to have a main player in place that could lead the region’s economic development. The joint campus will propel industrial specialization and serve as a catalyst to attract competent universities to the region. This paper will examine the concept, major functions, and the establishment and operation of the joint campus.

Keywords

Innovation infrastructure; Joint campus; Innovation system; Characterization
ing relevant laws, designing urban infrastructure, creating a relocation plan for central administrative organizations, and establishing a multi-phase development plan (See the website of the Happy City Construction Office\(^1\)). The city began to be developed under the name of the Administration City Complex. The first phase of its development plan (2007-2015) was focused on the construction of urban infrastructure, residential facilities, and facilities for 16 central administrative organizations, 20 affiliated organizations, and 12 state policy research institutes, all of which were to be relocated to Sejong City. With the continued influx of population as the development project progressed, Sejong has become a city with 220,000 residents as of 2016. The goal of phase II (2016-2020) is to create an endogenous driving force for sustainable growth by nurturing specialized industries.\(^2\) Phase III (2021-2030) aims to make it a self-sufficient city with the population of 500,000, equipped with sufficient housing and urban facilities.

Upon the completion of the first phase of its development as planned, the next step was to create a basis for economic and industrial growth and to enhance the innovation capacity of the region in order to sustain its urban development. For this, Sejong City has included the establishment of an innovation cluster as a key agenda in phase II of its development and launched policies to attract innovation drivers, such as universities, research institutes, and businesses, through the Tech Valley project and to create a regional innovation system based on institutional support to promote industry-academia cooperation. Given the region’s industrial infrastructure and research capacity, in particular, Sejong City will build a joint university campus with a plan to harness the capacities of universities as an engine to strengthen the region’s specialized industries, to cultivate highly skilled workforce, and to bring out industry-academia-research collaboration. In this project, several universities with different strength and areas of specialization will be located on a single campus to share facilities and cooperate with each other in education, research, and industry-academia collaborative activities.

This paper will examine the city’s plan to build a joint campus as a core element in Tech Valley, an umbrella project designed to promote the sustainable growth and innovation capacity of Sejong City. This paper will also attempt to identify what is expected of from the joint campus and how it will influence the creation of an innovation system and overall development in the region.

II. OVERVIEW: THE DEVELOPMENT PLAN OF TECH-VALLEY IN SEJONG CITY AS REGIONAL INNOVATION INFRASTRUCTURE

In order to secure sustainable development, the city should develop necessary capacities. In South Korea, new cities generally develop in the form of a satellite city growing around a metropolitan city, sharing some of the functionalities of the large city. Upon the completion of the relocation of the government organizations planned in phase I, Sejong City has moved its focus of development to securing its residential functions, e.g. fulfilling housing, recreational, and transportation needs, and has now embarked on Phase II of its development. The goal of Phase II is to enhance its self-sufficiency through industrial development.

Securing the self-sufficiency of the new administrative capital requires developing regional industries and for this, it was agreed that it is necessary to build an innovation system and infrastructure to attract competent businesses. This has led to a plan to create an innovative environment as follows. First, a plan to develop innovation infrastructure was implemented with an aim to encourage business innovation by attracting universities, research institutes, and businesses, and to stimulate industry activities in the region. Tech Valley, a project to build an industrial complex aiming to stimulate interactions among innovation agents, is central to the second phase of the city’s development plan. By 2020 when Phase II is complete, there will be universities, innovative businesses, and support facilities, in addition to a science complex, a knowledge industry center, and a venture business park. Furthermore, there will be policies in place to facilitate business activities and interactions among those innovation agents.

The joint campus project is receiving particular attention as a key ingredient in the city’s efforts to support the early settlement of Tech Valley, to lay a foundation for industrial special-

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1 Sejong City’s Basic Construction and Development Plan, Multifunctional Administrative City Construction Agency, 2006 (Accessed on October 14, 2017)
2 The 40th meeting of ‘the Committee on the Construction of the Administrative City’, which was held in the Government Building Complex in Sejong city on February 23, 2016, decided the goal of Phase II of Sejong city’s development plan to be the creation of an innovation cluster based on industry-academia cooperation with an aim to secure an endogenous growth.
ization, and to attract innovative businesses. Once the construction of facilities is complete, there will be a new joint campus to accommodate multiple universities on which they can share education/research facilities and programs as well as support facilities. The city government is expecting that these universities will lead industry-academia cooperation, supply skilled workforce to the region’s industries, and thereby contribute to the establishment of an innovation system.

2.1 Status of innovation infrastructure around the Tech-Valley area

The area in which Tech Valley will be located has excellent innovation infrastructure, which is expected to continue to expand. The neighboring cities including Daejeon, Cheongju, and Cheonan are concentrated with high-tech production facilities, including IT, BT, and high-tech R&D facilities. In particular, the Daedeok Innopolis located in Daejeon has R&D facilities for basic and applied science, research facilities and venture businesses related to high-tech industries. Therefore, it is expected that innovation agents in Tech Valley will greatly benefit by cooperating with the businesses and research institutes in this area.

Daedeok Innopolis consists of the Daedeok Research Complex, the Daedeok Techno-valley, the Daedeok Industrial Complex, the Defense Science Research Complex, and a green belt area. This region also has 26 state-funded research institutes, seven universities, twelve corporate research institutes, 24 support facilities, and about 1,600 companies, with a total of 67,000 highly skilled workers.\(^3\) In particular, the interna-
ional science and business belt, which is currently under construction in the green belt area, will encompass an area of 2,703,000 ㎡ to have basic science research facilities, including a heavy ion accelerator, a high-tech industry complex, and support facilities.

To the east of Tech Valley lay the Osong Life Science Complex and the Ochang Science Industry Complex. The former, which covers an area of 4,619,000 ㎡, is a high-tech industrial complex created by the central government with an aim to nurture medical and bio industries. It consists of a high-tech medical facility complex, production facilities, a business district, and residential/support facilities. The area has businesses and research institutes related to chemical, food, and medical industries. The Ochang Science Industry Complex, which is located in the neighboring area and covers an area of 9,450,000 ㎡, has environment- and energy-related companies, in addition to electronic, electrical, high-precision, medical, and IT companies.

In summary, the area in the vicinity of Tech Valley is concentrated with high-tech facilities, universities, and research institutes and Tech Valley will be centrally located in the innovation cluster connecting Daedeok, Osong, and Cheonan.

2.2 Major content of the Tech Valley and joint campus projects

In response to a call for an industrial base and enhanced innovation capacity for the city’s sustainable growth, a plan was implemented to create an innovation system centered on specialized universities. Tech Valley is a project designed to establish innovation infrastructure, to facilitate interactions among innovation agents, and to build an innovation system in the region. The plans implemented under this project are as follows (Lee Seo-jeong et al., 2017):

- Attracting research-focused universities and research institutes to create a research complex;
- Establishing a joint campus for specialized universities;
- Creating infrastructure to nurture venture businesses; and
- Establishing support facilities to create a regional innovation system and build a cooperative network.

Different from the development of an industrial complex designed to attract businesses and production facilities, the Tech Valley project is a sort of “Technopolis” development project aiming to promote innovation by bringing in both innovation actors, such as universities, businesses, research institutes, and support organizations into one place and
facilitating their interactions and cooperation. Based on this idea, the region’s development plan includes a joint campus, a science complex, a campus town, campus support facilities, a residential district, and a venture business district (Lee et al., 2017). <Figure 3>

Participating universities will have a research-centered campus and a joint campus; and the campus town will include commercial and business districts, recreational facilities, and residential districts. The science complex will consist of a research park, a research core, and a venture business park. In the research park, about ten state-funded research institutes and corporate research institutes in nano and bio sectors will be located; and they are expected to benefit from cooperation with related facilities in the International Science Business Belt (ISBB), Daedeok Innopolis, and the Osong Life Science Complex. The research core will have a science and business plaza, a business incubation center, and a knowledge industry center. Here, the science and business plaza is expected to play a leading role in drawing industry-academia cooperation and the commercialization of cutting-edge technologies. Last, the venture park will bring in innovative businesses in the Bio-Nano sector to the region; plus, customized policies will be implemented to enhance the competitiveness of the region’s bio industry.

The joint campus project, in particular, is designed to increase the competitiveness of strategic industries in the region through the production of highly competent workers, collaborative research, and the shared use of research facilities and equipment.³

III. CHARACTERISTICS OF THE JOINT CAMPUS PROJECT

3.1 Establishment of a joint campus and specialization

By drawing a pool of talent and global businesses, universities can play a critical role³ as an innovation center in promoting the region’s economic activities and sustainable

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³ The joint campus, which will be built on an area of 100,000㎡ with total investment of 360 billion won, is a new model of university campus, in which multiple universities share education/research facilities, facilities for industry-academia cooperation, and support facilities (NAACC, accessed October 20, 2017)

³ Through the Applied Science NYC project (2013), Michael Bloomberg, the former mayor of New York City, emphasized that human resources are the basis for regional growth. The Applied Science NYC project aims to bring in 280 professors and 2,500 highly skilled workers with master’s and/or doctoral degrees - which is more than double the current number- in order to make the city the center of the 21st century education. It also aims to nurture some 60,000 venture businesses based on the innovative activities of high-quality human-ware (Applied Science NYC, 2017).
development (Oh, 2016). Establishing an innovation cluster centered on universities will increase the region’s education and research capacities. They will also contribute to strengthening the innovation capacity and competitiveness of local industries by promoting close cooperation among support facilities, R&D centers, research institutes, HEIs, and high-tech businesses. Furthermore, interactions among innovation agents will greatly contribute to the cultivation of highly skilled talent, R&D-based technological innovation, and the development of creative ideas, creating a virtuous cycle of knowledge-based innovation. In the longer term, laying a foundation for innovation will serve as an engine for the region’s endogenous economic growth.

Typical universities in South Korea are academically oriented and separated from urban living quarters; and their disciplines and curriculums have often developed separately from regional industry structures. As the importance of innovation capacity increases in regional economic development, there is a growing call for universities to change their roles accordingly. Recently, there has been a heated discussion on the specialization and regionalization of higher education in South Korea. Strategies for specialization have been identified as the following: program diversification; program specialization; and diversification of the functions and roles of universities. The universities established based on the system of industry-academia cooperation will play a key role in an innovation cluster designed to lead the region’s economic development. The concentration of specialized universities, in particular, will drive the production of highly skilled human resources and the region’s industrial development. A cluster of specialized

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In order to promote specialization reflecting regional characteristics, following suggestions were made: to encourage the specialization of universities and provide institutional support to enable it; to customize university curriculums in order to cultivate human resources that meet the demand from the region’s specialized industries; to strengthen the roles of universities in enhancing industry-academia cooperation; and to secure measures to promote capacity for self-reliance among universities (Lim, 2009).
universities is considered a very effective model that maximizes the impact of education, research, and industry-academia cooperation, as well as the efficient use of space.

### 3.2 Programs at the joint campus

Sejong City has established the goal of Phase II of its development initiative to be the construction of science and business infrastructure for the knowledge industry. Its strategy for specialization is developing high-tech industries through industry-academia cooperation, creating a basis for high-tech industry network, and attracting/cultivating a pool of talent.

The city is implementing the Tech Valley project as part of its urban development strategy to nurture specialized industries and at the same time is working on the joint campus project to attract competent universities as an engine to facilitate interactions and collaboration in the city’s innovation zone. This is because securing competent professionals in the science and technology sector and nurturing high-tech industries are considered prerequisites for knowledge-based high-tech industries. The city’s plan is to bring in universities with specialized competencies through the joint campus project, while developing a regional innovation system through the Tech-Valley project that includes R&D programs, business incubation, and business support services.

Considering the characteristics of the region, which is concentrated with innovation infrastructure, including the Daedeok Science Town, the international science and business belt, the Institute for Basic Science, the Osong Life Science Complex, and the Ochang High-tech Industry Complex, the city government has chosen BT/IT/ET convergence technologies as its area of specialization. The need for a central organization to lead industry-academia cooperation has led to the concept of a joint campus for specialized universities.

In order to achieve the goals of the joint campus, open programs, different from traditional university programs, have been designed. An open curriculum system has been adopted as a principle for programs on the joint campus. The goal is to maximize opportunities for exchanges and cooperation through the sharing of educational programs and research activities among participating universities.

#### Open curriculum system

Research has been launched in order to design an open education system that includes team teaching programs, common general courses, expanded credit transfer programs between participating universities, and the shared use of laboratories. First, team-based teaching is a model of education, in which professors and business professionals cooperate to offer courses with an aim to cultivate innovative workers in demand by companies. Individual universities will develop their own general courses based their areas of specialization but open them to all students on the campus. One of the advantages of sharing courses like this is that the quality of the courses is usually very high since the courses are designed based on the specialized area of each university. In addition, students can enjoy a wider range of choices and effectively access the resources of different universities.

Credit transfer programs are relatively common among universities in South Korea. However, they are not actively used due to both physical limitations in taking courses in other campuses and different credit/lecture systems between universities. Credit transfer programs on the joint campus are expected to be more practical since there will be little physical restrictions in accessing courses in other universities.

Along with the provision of open courses, the shared use of laboratories is also expected to maximize the efficiency of research activities since participating universities and companies jointly invest in and utilize the equipment and facilities.

#### Joint curriculums and research

Currently, there is a plan to develop joint curriculums for undergraduate and graduate programs with an aim to produce skilled professionals for the medical bio sector, which is one of the region’s industries of specialization, and to increase the openness of education between participating universities. Joint curriculums and programs will be designed in a way to facilitate the exchanges of resources between universities, research institutes, and companies and to provide more refined educational programs.

When it comes to research activities, joint investment will be pursued for common research facilities and equipment, including high-tech medical bio equipment, a core technology center, and a clinical test center, in order to promote convergence research between different organizations. Furthermore, academic meetings will be planned on a regular basis in order to strengthen networking and cooperative research among researchers and professionals on the joint campus.

#### Industry-academia cooperation

There is an ongoing discussion about establishing an industry-academia cooperation council in order for participating universities to operate industry-academia collaboration activi-
ties with greater efficiency and to more promptly respond to the needs of the industry sector. The universities can also expand their scale of activities by jointly providing programs for entrepreneurship and employment, exhibitions, and/or events, and locate businesses on campus so that industry-academia cooperation is promoted in the earnest sense. These on-campus businesses may directly participate in university programs, enhancing their business competitiveness and increasing employment opportunities for students. By expanding cooperation between universities and businesses in the provision of general and core courses, internship programs, and club activities, a paradigm shift will be encouraged among students in their perception of regional companies and businesses will be able to attract highly skilled talent.

Provision of joint curriculums

Joint curriculums will be created for general and core courses, respectively. Curriculums for both the areas of specialization and lifelong education will be jointly devised and operated by participating universities.

Courses on basic science such as mathematics, physics, and chemistry will be jointly provided by participating universities, while general courses will be developed separately by individual universities but open to all students on the campus. Special general courses linked with the region’s specialized industries will be jointly operated by on-campus universities.

When it comes to core courses, each university will create its own curriculum and programs in connection with the region’s specialized industries. The impact of education will be enhanced through curriculums focused on problem-solving and convergence research. In particular, curriculums linked to the region’s specialized industries will be jointly operated: each university will develop programs based on industry demands and share them with other universities. These specialized programs will tap into the human and physical resources of research institutes and businesses in the area, facilitating interactions among innovation agents.

The universities on the joint campus will be able to cultivate competent workers through joint programs and to accumulate and commercialize research accomplishments. A sustainable supply of highly skilled talent in specialized areas will in turn attract more research institutes and innovative companies to the region.

The joint operation of facilities and programs by various innovation agents are expected to increase operational efficiency and research accomplishments among participating universities and institutions, catalyzing the creation of a virtuous cycle of attracting greater resources to the region: securing talent, compiling research accomplishments, commercializing research findings, attracting innovative organizations, and then bringing in more talent.

3.3 Spatial planning for the joint campus

The joint campus will consist of educational facilities, support facilities, and recreational/sports facilities. Dormitories and other residential buildings will be part of public housing that will be developed along with the Tech Valley project. A total of three research-oriented universities will be constructed on the joint campus, which will be located at the center of the city’s innovation zone. The innovation zone will comprise universities, support facilities, and a venture park, with universities playing a key role in stimulating cooperation and interactions among innovation agents.

The development of the joint campus will be implemented on a step-by-step basis in consideration of the schedule for the relocation of each university and their educational programs. Educational facilities, support facilities, and common facilities will be first constructed and then educational facilities for universities relocating in phase II will follow. Common facilities will all be constructed in phase I (See Fig. 5).

In phase I of the development plan, 84429㎡, about 60% of the total area (140,715㎡), will be developed. The remaining 40% (56,286㎡) will be developed in phase II to complete the construction of the joint campus. The size of development for each phase was decided by considering the number of students, faculty members, and administrative staff: the development in phase I will accommodate 2600 students, 140 faculty members, and 130 university employees; and the development in phase II will cover 2600 students, 137 faculty members, and 120 university employees.

Educational facilities will be constructed in two separate buildings for the purpose of step-by-step development, while administrative and support facilities will be located at the center of the campus in order to ensure user accessibility and operational efficiency. Recreational and sports facilities will be located in the southern part of the campus, near the residential area, in order to allow easy access not only by students but also by community residents.

The educational facility that will be built in phase II is planned to be a multi-purpose building with spatial efficiency. The building will be designed in a way to maximize interactions and user accessibility among different universities: com-
Common facilities will be located in lower floors, facilities for individual universities in middle floors, and communal amenities in higher floors. As explained above, the campus will be designed to maximize benefits from sharing common multi-purpose facilities, including spatial and operational efficiency, convergence education, and exchanges between the members of different universities.

IV. SUMMARY

Since it was chosen as a new administrative capital of the country, Sejong City has completed the first phase of its development plan and is undergoing the second phase of development. In order to promote sustainable growth, Sejong City has established goals for development: nurturing strategic indus-

Fig. 5. The step-by-step development plan of the joint campus facility

Source: NAACC (2015)

Table 2. Facility area plan of joint campus development

<table>
<thead>
<tr>
<th>Facilities</th>
<th>Total facility area (m²)</th>
<th>Phase 1 facilities area (m²)</th>
<th>Phase 2 facilities area (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational facilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classrooms / Laboratory / Research office</td>
<td>53,716</td>
<td>26,858</td>
<td>26,858</td>
</tr>
<tr>
<td>Library</td>
<td>6,130</td>
<td>4,800</td>
<td>1,330</td>
</tr>
<tr>
<td>Supporting center (University Headquarters)</td>
<td>3,500</td>
<td>2,040</td>
<td>1,460</td>
</tr>
<tr>
<td>Student facilities</td>
<td>7,100</td>
<td>4,200</td>
<td>2,900</td>
</tr>
<tr>
<td>Gym</td>
<td>3,760</td>
<td>3,760</td>
<td></td>
</tr>
<tr>
<td>Auditorium</td>
<td>5,610</td>
<td>5,610</td>
<td></td>
</tr>
<tr>
<td>Parking lots</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total area</td>
<td>79,816</td>
<td>47,268</td>
<td>32,548</td>
</tr>
</tbody>
</table>

Source: NAACC (2015)
tries, attracting competent universities as an engine for continued innovation, and creating a regional innovation system centered on those universities. In regard to establishing an innovation system, however, attracting universities with competence for research and education was a challenge. Universities with such competence usually have in place a good system for research and education on their campus. Attempting to relocate these universities to a new area could entail a number of challenges and risks. This is why many new town development projects had plans to attract universities but few succeeded. Given the status of Sejong City as the country’s new administrative capital, however, a plan to attract competent universities is very reasonable and cannot be easily abandoned.

The joint campus is a new model for establishing universities. It creates a win-win situation for both the region that needs a competent university and for a university that is seeking a regional campus with specialization. This model is receiving increasing attention since public organizations, which lead a new town development project, provides campus infrastructure along with various support policies, while universities can rent facilities and pursue specialized education and industry-academia cooperation without a high-risk investment. In addition, participating universities will be able to improve efficiency in their research and education through both cooperation and competition with other universities and businesses and to enhance their competitiveness through increased capacities for commercialization of research results and business incubation.

**Attracting competent universities and strengthening their competitiveness**

The establishment of a regional campus of a major university could be more easily achieved by a model in which public orga-
nizations build educational and research facilities on the joint campus while participating universities rent the facilities and equipment and jointly run programs of education, research, and industry-academia cooperation. Sharing campus facilities and programs will not only facilitate interactions and cooperation among the universities and other innovation agents in the region but also promote research for the region’s strategic industries. Such interactions and cooperative activities will in turn raise the quality of university programs as the universities can tap into the expertise of skilled professionals in the region.

Enhancing R&D capacities through specialization

The shared use of facilities and programs on the joint campus could greatly contribute to the development of the region's specialized industries by converging capacities for research and industry-academia cooperation and facilitating interactions among the universities and regional industries. In particular, strengthened exchanges and cooperation among innovation agents, including public organizations, research institutes, and businesses, centered around the collaboration among the universities on the joint campus is expected to further promote education and research in the area of convergence technology.

Industry-academia cooperation and the establishment of an innovation system

A cooperative system established among participating universities based on the sharing of facilities and programs will lead to cooperation with other innovation agents including research institutes and venture businesses, laying a foundation to expand industry-academia cooperation. Securing a basis for education and research through the joint campus project will be greatly conducive to the development of Tech Valley and the smooth settlement of participating businesses and organizations in Tech Valley. An innovation system based on industry-academia cooperation centered on the joint campus will expedite the development of strategic industries and convergence industries in the region, eventually contributing to the development of an innovation cluster that connects Daedeok, Sejong, Osong, and Cheonan.

The joint campus could be a good model for a regional development plan to establish innovation infrastructure and to stimulate innovative activities in a newly developed city that has yet to attract innovation agents. While good infrastructure is needed in order to attract innovation agents, just having the infrastructure does not mean that organizations and businesses will move to the area. It is because innovation agents need not only good infrastructure but also opportunities for cooperation and interactions with other actors. In an area that has yet to develop innovation capacity, in this regard, it is an important task to develop not only infrastructure but also a basis for core activities that would enable the creation of an innovation system. As in the case of a joint campus project, establishing a basis for cooperation through the shared use of facilities and programs among participating universities could greatly contribute to regional growth.

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