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Letter from the Editor-in-Chief

Myanmar and Korea have many similarities and are complementary relationship. Therefore, we believe that research exchange will expand mutual understanding between Myanmar and Korea, and will be the cornerstone for mutual development.

KOMYRA and YUE have co-published The Myanmar Journal since August 2014. So far, many scholars have published numerous papers through the journal, and We are sure that this journal has helped many people understand Myanmar and Korea more clearly and closely.

The Myanmar Journal covers various issues in Myanmar and Korea. It covers various topics that can promote bilateral development and mutual understanding, not limited to specific topics such as economy, industry, society, education, welfare, culture, energy, engineering, healthcare, and agriculture.

We hope that this journal will continue to promote understanding of the current status and potential capabilities of Myanmar and South Korea and promote in-depth international exchange and cooperation.

We would like to express our deepest gratitude to the editorial board and YUE and KOMYRA for their valuable support in The Myanmar Journal publication.

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Youngjun Choi *yj choi*

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INFORMATION ABOUT The Myanmar Journal

The Myanmar Journal (ISSN 2383-6563) is the official international journal co-published by Yangon University of Economics (YUE) and Korea Myanmar Research Institute (KOMYRA).

This journal aims to promote the mutual cooperation and development of Myanmar and Korea through intensive researches in the entire field of society, economy, culture, and industry.

It will cover all general academic and industrial issues, and share ideas, problems and solution for development of Myanmar.

Articles for publication will be on-line released twice a year at the end of February and August every year on the Myanmar Journal webpage (http://www.komyra.com/bbs/board.php?bo_table=articles).

Global Future Trends and Technology Required for Korean Industrial Complexes for Consumers

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ABSTRACT : Industrial parks play an important role in manufacturing production, export, and employment. However, global trends and changes and the spread of the 4th Industrial Revolution are undermining the vitality of industrial complexes, which are the cradle of manufacturing and small and medium-sized enterprises (SMEs), and the weakening of corporate competitiveness and slowdown in manufacturing. In addition, the changes in our daily life due to the corona pandemic are changing at a faster rate than before in the form of changing urban functions and lifestyles beyond the level of improvement in living convenience due to technological development. Accordingly, efforts are required to digitalize resident companies and industrial complex public facilities based on global trends, establish a shared platform, improve the residential environment, and promote eco-friendliness. Considering the importance of industrial complexes, upgrading of industrial complexes in line with global trends is required. Here, we looked at global future trends and explored issues and implications for industrial complexes caused by technological changes.

Key words : *industrial complex, the 4th industrial revolution, manufacturing, SMEs, global future trends,*

I. Introduction

The rapid development of ICT is creating new trends in social/technical/economic/environmental/political fields around the world, triggering changes in the future society.

Predicting the future is very important, and many countries and major international organizations are trying to predict the future and establish response strategies. The future is changing. Therefore, it is important to predict the change demand of Korean industrial complexes based on global trend changes. This is because Korean industrial complexes have a great influence on Korean industrial production and economy.

The term "industrial complex" means industrial facilities and related education, research, work, support, information processing and distribution facilities, and housing, culture, environment, parks and green spaces, medical care, tourism, sports, welfare facilities, etc. to improve the functions of these facilities. It refers to land designated and developed according to a comprehensive plan for collective installation (Article 2, No. 8 of the Industrial Location and Development Act).

In other words, it means a place where several factories are gathered. In the past, it was called an industrial complex, or industrial complex for short. In the case of Korea, as the five-year economic and social development plan was implemented from 1961, numerous industrial complexes were built across the country, starting with Ulsan Industrial Complex in 1962. Since the 1990s, under the influence of post-industrialization, the high-tech industry and information industry, which require a small number of specialized manpower on a small site, have begun to develop rather than the manpower-oriented light industry and the heavy chemical industry which requires a large-scale factory site.

Meanwhile, industrial complexes account for 63.9% of manufacturing production, 65.7% of exports, and 49.2% of employment (as of 2019).¹⁾

The vitality of industrial complexes, which are the cradle of manufacturing and small and medium-sized enterprises (SMEs) and the backbone of the local economy, is declining due to the weakening of corporate competitiveness and the slowdown in manufacturing. In the past, industrial complexes, the core base of economic development and the largest concentration of companies, have many issues such as high energy consumption, environmental problems, and decreased productivity.

Here, we looked at global future trends and explored issues and implications for industrial complexes caused by technological changes.

1) In Korea, starting with the Guro Industrial Complex established in 1964, as of May 2021, 1,241 units nationwide and a total area of 1,434 km² (industrial location information system, Ministry of Land, Infrastructure and Transport) have been designated. Industrial complexes contributed greatly to national industrialization and economic development by providing large-scale factory land supply and production and logistics infrastructure, and are still being used as a major means of job creation and economic revitalization.

II. Global future trend change

1. Global Future Transition Prospect

The developing ICT technology will establish itself as a continuous megatrend. As a general-purpose technology that can be integrated into all industries, ICT is expected to increase its influence by overcoming existing limitations, such as expanding its utility and enabling human-machine collaboration.

Table 1. Major reports on future prospects at domestic and abroad

Report name	Agency	date	Main Content
The World Remade by COVID-19	Deloitte	20. 4.	Variables include the mass production of COVID-19, the level of cooperation between countries, the level of crisis response of the medical system, the economic impact, and the social cohesion to respond to the crisis. 1) A passing typhoon 2) Stakeholder capitalism 3) Reorganization of the international order 4) Global isolationism, etc. Deriving a total of 4 future scenarios
How will coronavirus change the world?	BBC	20. 3.	By setting the economic and social value direction and centralization as variables, we crossed over to derive a total of four future scenarios: 1) national capitalism 2) barbarism 3) national socialism 4) mutual aid
Scenario Planning for Canada's COVID-19 Response from the International Development and Humanitarian Sector	CCIC	20. 5.	Deriving policy implications for the Canadian Ministry of Foreign Affairs from the perspective of advancing international relations and promoting humanitarianism Deriving 4 future scenarios according to pessimistic-optimistic levels and suggesting implications
Scenario planning for a post-COVID-19 world	IMD	20. 5.	Set the epidemic spread period, global cooperation level, and digital adaptation level as variables, cross-analysis, 1) Global market 2) Return to basics 3) Digital initialization 4) Derive a total of 4 future scenarios including fence garden
Coronavirus Will Change the World Permanently. Here's How	Politico	20. 3.	Community, Technology, Healthcare/Science, Government, Election, Global Economy, Lifestyle
The World After Coronavirus	Politico	20. 4.	Technology, economy, politics, environment, etc.
5 Predictions for a Post-Covid World	Solidaridad	20. 5.	International order, economic change, environment and energy, food supply chain, digital industry environment change, etc.
COVID-19: Post-Coronavirus technology trends	Accenture	20. 6.	Digital-centric change, human cooperation AI, robot ecosystem, Privacy issues, increase in innovative technology,

			etc.
The Covid-19 changes that could last long-term	BBC Future	20. 6.	Prospects of future forecasting experts' personal life, new workplace, climate revolution, etc.
9 Future Predictions For A Post-Coronavirus World	Forbes	20. 4.	Future expert prediction non-face-to-face technology, medical and healthcare, business, entertainment, etc.
Post-Corona Future Prospects and Promising Technologies	KISTEP	20. 4.	Non-face-to-face social transformation, bio-health market growth, Routine risk response, strengthening nationalism, etc.
19 new trends in the post-COVID-19 era	Nunwha daily new's paper	20. 5.	Government, politics, environment, international order, spread of untact culture, etc.

Source: Economics, Humanities and Social Research Society (2021)

Table 2. Prospects of 6 global trends after Corona

6 major trends	21 major issues	Major changes after Corona
(Economy, daily life) non-face-to-face society, the birth of the street	Changes in production, consumption and distribution	- Unmanned the entire production and distribution process to secure stability in automation to increase productivity, and spread online consumption trends
	Changes in work and labor structure	- Concerns about the proliferation of automation and remoteization of knowledge labor in the automation of physical labor and an increase in algorithmic and platform labor
	human relationship change	- The personalization trend that pursues loose solidarity is further reinforced by the contact phobia, which avoids meeting with people itself.
(Economy, daily life) non-face-to-face society, the birth of the street	income inequality	- Strengthening government intervention in the market to reduce the threat of community disruption caused by income disparity
	collective hatred and conflict	- In the process of responding to the spread of an infectious disease, it goes beyond the boundaries of others and amplifies hate and conflict according to gender, age, and race
	Information bias and pollution	- Community division and chaos that will be fueled by hyper-personalized information bias and intelligent information pollution created by AI media curation
(risk) unknown danger, a foreseen catastrophe	Unknown Danger, Black Swan	- Due to excessively connected complexity, 'black swan' events with global-scale destructive power occur frequently
	Old Dangers, Predicted Disasters	- Preparation is necessary so that the global danger as a 'grey rhino' that has been warned or foreseen for a long time does not become a catastrophe
	Future risk response and the role of technology	- Future research and digital technology utilization strategy to enhance future risk response capabilities ranging from black swans to gray rhinos
(Supply Chain) reaction to globalization, GVC	Deglobalization and localization	- Full-scale conversion to localization to secure flexibility and stability of the global supply chain and expansion of reshoring in the manufacturing industry

reorganization	Reinforcement of domestic production	- Securing the supply chain of food, health and medical care, daily necessities, and energy from the point of national security and expanding the domestic production base
	Digitalization of the supply chain	- Complete digitization conversion to secure flexibility in the entire process from procurement of raw materials to production, distribution and final consumer
(International Relations) series of collisions, the future of cooperation	US-China conflict spreads	- The trade dispute between the two countries has expanded in all directions, including technological, economic, political, military, and ideological conflicts after Corona 19
	European retreat, Asian rise	- European unity and the rise of Asian countries, loosening and weakening due to complex interests between the United States and China
	The revival of digital barriers	- As trade conflicts between countries lead to digital hegemony between major powers, the Internet world shows signs of division, centered on the United States and China.
	International order and the future of cooperation	- Changing the liberal international order resulting from a long-term conflict between the US and China and forming a new way of cooperation between countries
(technology) of everything digital, speed and direction	The role of technology	- Re-establishment of the role of digital technology as a necessity for survival as an auxiliary tool for life and livelihood
	speed of technology	- Increasing corporate and government investment, enhancing social acceptability, etc. The period of technology diffusion is compressed and accelerated, and social change is accelerated.
	direction of technology	- Increased pressure to develop new technologies to address various social needs that have emerged after COVID-19 and prepare for future risks
	Data innovation and sovereignty	- Strengthening data-based innovation and securing data sovereignty in a completely digital society where everything is defined by data
	ICT companies and the power of the state	- Reinforcing the role of the government due to the expansion of the scale and influence of global ICT companies and the rise of technological nationalism among the great powers

Source: ETRI, 2020.

Therefore, it is necessary to preemptively prepare for “technology” that shifts the center to “human” and “environment”.

Society is approaching a new world in which humans and technologies coexist harmoniously. With the spread of automation/unmanned systems, “human labor substitution” and “productivity orientation” are progressing at the same time.

With ICT technology that transcends the limits of technology, society/economy is undergoing a total change. We need to prepare so that promising fields such as nano and bio can bring modernity to all industries. It is required to establish a

“digital ethics” for the dysfunctional and people-centered use of technology.

The economy is accelerating the transformation of economic value and digital economic structure. It is the diffusion of “use” and “share” values that replace “owning”.

As for the environment, the spread of the circular economy model and eco-friendly/high-efficiency ICT are progressing. Eco-friendly and energy-efficient green ICT is expected to expand.

In politics, active participation and solidarity through ICT are expanding. The expansion of digital participatory democracy and global cooperation is expected.

2. Changes in global future technology trends

Currently, various advanced technologies such as artificial intelligence, robotics, Internet of Things, autonomous vehicles, 3D printing, nanotechnology, biotechnology, materials engineering, energy storage technology, and ubiquitous computing are being discussed as the leading technologies of the fourth industrial revolution. .

In particular, among these technologies, technologies in the fields of physics and biology further amplify each other's fields through mutual exchange and technological convergence with digital technologies, while technological change in some fields has already occurred at an exponential rate, and in some cases, technological advancement has already taken place at an exponential rate. It is evaluated that the inflection point has been reached (Korea Industrial Complex Corporation. 2017).

The 4th industrial revolution is not a technology that appears and disappears at a certain point in time, but it has the characteristics of a so-called general purpose technology while continuously exerting its influence even today.

Here, the characteristics of general-purpose technology are: First, it is not limited to a specific field, it causes technological innovation in various fields to change the existing production mode, and second, various complementary inventions and innovations using a new technological paradigm are chained over a long period of time. characteristics that appear.

In this respect, the strongest candidate technology for the core leading technology of the 4th industrial revolution is so-called intelligent information technology.

These technologies combine data utilization technologies such as artificial intelligence technology (AI), Internet of Things (IoT), clouding, big-data, and mobile technology to provide machines with human cognition and learning. · It refers to all technology groups that implement reasoning capabilities (Korea Industrial Complex Corporation. 2017).

On the other hand, the impact of the 4th industrial revolution caused by

disruptive innovative technologies such as IoT (hyperconnection), big data (new capital), and AI (super intelligence) is not only in manufacturing and energy, but also in services such as finance and transportation, and in various fields such as cities. appears throughout.

In particular, the 4th industrial revolution in the manufacturing sector is leading to differentiated 'smart manufacturing' from the existing ones, as the manufacturing and service industries are convergence based on various ICT infrastructures and inducing 'smartization' of the manufacturing site.²⁾

Therefore, the manufacturing industry will achieve optimization throughout the manufacturing ecosystem beyond simply changing or optimizing the production process in an environment where everything is networked and hyper-connected.

In addition, through smart production, quality and efficiency improvement, as well as rapid and accurate predictive maintenance, anomaly detection, virtual prediction, quality control, and energy saving will be possible. The fire will also accelerate (Sang-Hoon Kim, 2017).

Therefore, the core of the manufacturing perspective in the discussion of the 4th industrial revolution requires a great transformation from the existing method for a future leap forward.

It is necessary to quickly respond to new changes and to improve preemptive conversion capabilities by breaking away from the stereotypes of existing policies and the dichotomous thinking of the manufacturing/service industry in planning for a further leap forward in the future manufacturing industry.

In establishing a strategy for re-jumping in the manufacturing industry, it is required to first recognize the direction of a huge change in the manufacturing industry and to improve its transformation capability, breaking away from the existing strategy for enhancing competitiveness and policy response paradigm.

III. Future industrial complexes and consumer issues

Technological innovation according to the 4th industrial revolution, and the economic and industrial paradigm change triggered by it, have a great impact not only on the production activities and value chains of individual companies, but also

2) In industrial settings, the terms production and manufacturing are often used interchangeably according to language habits without any special difference in meaning. Therefore, each term, such as production management and manufacturing management, production process and manufacturing process, production support system and manufacturing support system, is sometimes used with the same meaning, and sometimes used with different meanings depending on the habits used in the field (ETRI, 2018) .

on the location of companies and the industrial complexes that have served as the core base of manufacturing. have.

A society of high automation and hyper-connectivity, represented by technological innovations such as artificial intelligence (AI) and Internet of Things (IoT), reduces dependence on location factors such as land and transportation conditions in location selection.

In addition, the importance of transportation costs can be reduced, and innovations such as production process methods to achieve 'smart manufacturing' are being treated as important.

In addition, the need to expand the network to enter the global value chain is also required, which means that things/people, products/services, etc. are combined with disruptive technologies such as the Internet of Things (IoT), big data, and artificial intelligence (AI) to interconnect them. This is because, in the manufacturing industry, the key to creating new value by connecting data and making it intelligent, rather than simple technology or product price and quality, is becoming smarter.

Accordingly, the production method has been improved from mass production of small types to customized flexible production, and the competition unit is expanding from stand alone to systems such as smart factories, smart buildings, smart industrial complexes, and smart cities.

On the other hand, due to the business model shifting to 'product + service' or 'service' rather than product unit, front and rear services such as design, design, SW, and maintenance (O&M) that create new added value for companies support is becoming more and more useful.

As a medium that connects and integrates multiple products and services, that is, a platform-based business model is formed, business is shifting from a linear value chain form to a network-type collaboration center (complex value matrix), and Platform competition will intensify.

Based on these platforms, the sharing economy and the spread of on-demand-based manufacturing production methods will lead to a reduction in the scale of production facilities.

In terms of industrial complexes, the demand for industrial spaces with complex functions will increase as the advanced manufacturing technology becomes more intelligent.

Instead of creating large-scale industrial complexes that have been developed so far, it leads to development demand for high-tech complex spaces adjacent to the city center.

In addition, the need to provide training and education for new technologies is increasing, and the need for a space for nurturing creative convergence-type talents is emerging.

The environmental and technological changes surrounding the current manufacturing industry, including the fourth industrial revolution, are happening faster than ever. At the forefront, the driving force that will lead the 4th industrial revolution lies in the innovation of manufacturing and strengthening of competitiveness, and the foundation is starting from a future-oriented industrial complex.

Meanwhile, the world is entering a hyper-connected real-time information society with the advent of the 4th industrial revolution era such as IoT, Big Data, and AI (Artificial Intelligence). The production paradigm is rapidly changing from supplier-centric to consumer-centric.

Therefore, due to changes in the external environment surrounding the industrial complex, the function and role of the industrial complex should be changed so that companies can promote high value-added products and focus on innovative research and technology development.

For this, it is necessary to create an environment so that the convergence and convergence of creative technologies in industrial complexes can be implemented and expressed in various ways in the field.

Meanwhile, the manufacturing industry is changing from the existing 'manufacturing model centered on tangible products' to a 'service-oriented manufacturing model' for survival and development.

First, it is a change in product concept. The concept is changing from a finished product to an evolutionary/converged product. In the era of the 4th industrial revolution, products can be connected not only with people, but also with all entities such as products and devices, and autonomous judgment, transmission, and storage are possible, and products sold are transformed into 'alive products'. are doing

Second, Product production through vertical combination. Until now, the manufacturing and service industries have been developed separately, but in recent years, the final convergence product combining products and services is becoming common. If the development of existing types of products that cannot be combined with services continues, there is a growing risk of becoming a supplier of final fusion products.

Considering the above, there are the following issues and tasks to be solved in the future industrial complex.

(i) It is a preemptive introduction of intelligent information technology. The introduction and diffusion of intelligent information technology, the core leading technology of the 4th industrial revolution, is expected to enable the creation of new industries for disruptive innovation and structural transformation of the existing industry as a whole. Therefore, in order to secure future competitiveness of industrial complexes, it is necessary to prioritize the preemptive introduction and use of

intelligent information technology, which is leading the 4th industrial revolution, while using it as a basis for product and process innovation in the overall manufacturing industry. need. This is because, in the course of the fourth industrial revolution, the superiority in these technologies and extensive technological innovation in the field of convergence with these technologies are absolutely necessary to create new markets and industries.

(ii) Securing future-oriented manpower and establishing an innovative environment. In the course of the fourth industrial revolution, the most urgently needed from the standpoint of companies that will lead the development of new industries is a company that can easily and innovate through securing innovation-led core manpower and building an innovative industrial ecosystem based on intelligent information technology. to secure the environment. It is necessary to provide incentives to industrial complexes where excellent and talented human resources from surrounding areas can be utilized. To this end, it is required to have an infrastructure and support system that can be utilized by all companies in the industrial complex, such as a better education system, a start-up incubation support system, and the establishment of a platform that can promote entry into strategic new business fields and investment. In addition, innovative start-up companies appear within the industrial complex, and it is required to create conditions for new industry development where new investors can pay attention. Manpower is very important for future-oriented industrial complexes, and it is necessary to supply locations close to the living environment of the city center. In particular, in order to revitalize new industries such as knowledge-based industries, a location in an urban area where comprehensive industrial foundations such as research base, information, high-quality manpower, transportation facilities, and living environment can be secured is required.

(iii) Establishment of an online information exchange and transaction platform between companies resident in the industrial complex. Cooperation is required for companies to create substantial profits in the fields of product and technology trade, recruitment and employment, joint purchase, and education through the establishment of an information exchange platform. In line with the 4th industrial revolution manufacturing innovation trend, it is necessary to improve the corporate structure of simple production-oriented industrial complexes and cooperate to revitalize start-ups.

(iv) It is a reflection of the characteristics of the manufacturing 4.0 era.³⁾ With the growth of new industries in the era of the 4th industrial revolution, industrial complexes that can reflect the characteristics of the manufacturing 4.0 era are

3) The key concept of Industry 4.0 is the way in which digital technology is used to pursue production efficiency.

required. In preparation for the 4th industrial revolution era, it is necessary to focus on digitalization of industrial complexes and cloudization of industrial complexes, and a complex complex combining production + support + culture is also needed (Sun-cheol Jang). In addition, industrial complex 4.0 equipped with multi-functional complex and new industrial infrastructure is required, and multi-functional complex industrial complex equipped with corporate support facilities and employee living convenience facilities is provided. It provides industrial complexes with complex educational functions, and along with this, the supply of industrial complex 4.0 with ICBM (IoT, Cloud, Big Data, Mobile), a new industrial infrastructure, is required.

(v) Expansion of the sharing economy. A shared rental space is provided to revitalize young entrepreneurs, and it is required to provide an inexpensive shared workplace where individuals or multiple companies share the same space alternately day and night. Such a shared space requires the supply of a space that can solve research, experiments, prototype production, rest, leisure, exercise, accommodation, meals, etc. all at once. In addition, an open industrial space where work can be done at any time by providing basic facilities (plug-in) necessary for companies is required (Yang-Sik Yang et al., 2020)⁴

(vi) Construction of a hyper-intelligent, hyper-connected industrial complex. A virtual cloud industrial space that can integrate the collection, analysis, and production of big data based on a super-intelligent connection system is required. A cloud space where information collection/analysis/production/distribution using big data in the era of the 4th industrial revolution is integrated in a virtual space is needed, and a cheap rental space (physical space) is provided for young people and information (It is necessary for the public to provide a cloud industrial space (virtual space) that provides a large-capacity information space that can store production) as a platform. Cloud space is a cloud computing-based industrial space where anyone, anywhere, any device, and all content can be accessed and utilized. synergies can be maximized. A future-oriented industrial complex refers to an "industrial complex that enhances corporate productivity through the connection and sharing of data and resources, and allows free start-up and testing of new industries" (Ministry of Trade, Industry and Energy, 2019).

4) Yang, Young-sik et al., A Study on the Development and Revitalization of a Sharing Economy Business Model in an Industrial Complex, *Northeast Asian Law Study* 14(1), 2020, 275-295.

Table 3. Future-oriented industrial complex elements

division	Smart Industrial Park Elements
manufacturing innovation	Smart factory, manufacturing data sharing, idle resource sharing economy platform, Smart Industry-University-Research Network, etc.
Worker-friendly space	Dormitory, officetel, happy housing, cooperative rental housing, culture, welfare, sports Center, joint daycare center, gymnasium, cultural center, etc.
futuristic industrial complex	Smart Startup Center, Negative Zone, Regulatory Sandbox, ICT Technology Base advanced infrastructure, etc.

Source: Euncheol Kim, 2019, p. 18.

Table 4. Major tasks for future-oriented industrial complexes

division	Major tasks
Manufacturing innovation (building a hyper-connected network of data and resources)	Collecting manufacturing data of tenant companies generated in smart factories Establishment of a manufacturing data center that analyzes and provides solutions Creation of manufacturing data security infrastructure such as establishment of manufacturing data sharing guidelines and certification of information security management system Establishment and operation of a sharing economy platform for idle resources and shareable services within the industrial complex Establishment of smart industry industry-academic-research network (mini cluster) by industry and joint projects, manufacturing data linkage projects
Worker-friendly space (region-tailored settlement and support for convenience and welfare facilities)	Expansion of residential facilities such as dormitories, officetels, happy houses, cooperative-type rental houses, etc. Expansion of cultural, welfare, and sports facilities such as cultural centers, communal daycare centers, gymnasiums, and urban forests Housing, experience/exchange, cultural/sports facilities, convenience facilities, etc. are integrated. Complex cultural center installation
Future industrial complex (support for start-ups and new industries and test bed for future new technologies)	Creation of start-up space (smart start-up center) and open lab through remodeling of closed/closed factories Introduced a negative zone pilot to expand the industries occupied by industrial complexes centered on the manufacturing industry and applied the regulatory sandbox first Constructing solar power on idle sites within industrial complexes and distributing ESS for peak power management for high-energy businesses Introduction of factory energy management system (FEMS) and establishment and spread of integrated energy trading platform Intelligent intersection/parking lot, environment/safety control center, autonomous driving infrastructure Step-by-step construction of futuristic high-tech infrastructure based on ICT technology such as

Source: Ministry of Trade, Industry and Energy press release, two smart leading industrial complexes selected (2019.2.20.)

Table 5. Futuristic industrial complex in the era of the 4th industrial revolution

division	19th - early 20th century	late 20th century	late 20th century
paradigm	Manufacturing 2.0	Manufacturing 3.0	Manufacturing 4.0
industrial complex	Industrial Park 2.0	Industrial Park 3.0	Industrial Park 4.0
production method	Bulk	Variety, small quantity	customized
Business Type	major company	Manufacturing/Software	Collaborative Small Business
location method	production facility	production support +	Composite production + living + culture
Talent	skilled technician	knowledge worker	creative talent
space type	physical space	digital space	physical + cloud space

(vii) Building an efficient residential environment. As the importance of innovative infrastructure and settlement environment increases in industrial complex development, interest in industrial complex complexation is increasing. This is because the better the settlement environment such as housing, education, culture, welfare, and sports facilities, the easier it is to secure professional manpower and the higher the quality of life of industrial complex workers.⁵⁾ In addition, as the era of the knowledge economy spreads, the demand for locations where knowledge services and R&D activities are easy and innovation support functions are increasing.⁶⁾

Table 6. Industrial complex innovation infrastructure and residential environment elements

division	sub-division	elements
Innovation Infrastructure Elements	Corporate and industrial support facilities and institutions	Technopark, business incubator, business support center, etc.
	Educational facilities and institutions	Universities, polytechnics, vocational training centers, etc.
	Research facilities and institutions	National research institutes, research institutes, technology transfer support centers, governments, local governments, public institutions, etc.

- 5) The residential environment is a facility necessary to enrich the lives of local members, and the quality of life can be evaluated. It is defined as a concept that includes not only existing living support facilities and related services, but also the level enjoyed by members. Residential, commercial/convenience facilities, finance/transportation, parks/sports, culture/welfare, medical facilities, etc.
- 6) Innovation capacity is defined as the ability to convert knowledge and ideas into new products, services and processes. Business, commercial, and convenience facilities are innovative infrastructures.

	Business and convenience facilities supporting Biz activities	Convention facilities, marketing support centers, hotels, logistics support facilities, etc.
Settlement Environment Elements	residential facilities	Apartments, houses, etc.
	Commercial/convenience facilities	Large marts, department stores, cafes, restaurants, convenience stores, etc.
	Financial and transportation service facilities	Financial institutions, post offices, logistics centers, couriers, etc
	Parks and sports facilities	Sports parks, swimming pools, parks, sports facilities, etc.
	Cultural Welfare Facility	Indoor and outdoor performance halls, theaters, cultural centers, etc. Kindergarten, nursery facilities, etc.
	medical facility	Hospitals, clinics, public health centers, pharmacies, etc.

Source: Euncheol Kim, 2019, p. 17.

V. Conclusion

Industrial parks play an important role in manufacturing production, export, and employment.

However, global trends and changes and the spread of the 4th Industrial Revolution are undermining the vitality of industrial complexes, which are the cradle of manufacturing and small and medium-sized enterprises (SMEs), and the weakening of corporate competitiveness and slowdown in manufacturing.

In addition, the changes in our daily life due to the corona pandemic are changing at a faster rate than before in the form of changing urban functions and lifestyles beyond the level of improvement in living convenience due to technological development.

Accordingly, efforts are required to digitalize resident companies and industrial complex public facilities based on global trends, establish a shared platform, improve the residential environment, and promote eco-friendliness.

Considering the importance of industrial complexes, upgrading of industrial complexes in line with global trends is required. Implications for securing competitiveness in future industrial complexes based on global trends are as follows.

(i) Building a sharing economy platform is required. Resource utilization at the level of individual companies may be limited, and in order to promote smartization of these companies, by establishing a sharing economy platform, it will be possible to contribute to strengthening competitiveness through efficient use of resources and expansion of information sharing. It is possible to build a platform (app) to connect idle facilities and equipment that can be shared within an industrial complex, and provide services such as sharing of assets and labor, and joint purchase of assets.

(ii) A program for securing talent is required. It is required to develop and operate programs for nurturing, attracting, and educating talents inside and outside the region, centered on local universities and local governments. Joint nurturing of manpower between companies, universities, and local governments is required, and it is required to establish a system in which various experts such as technical manpower in manufacturing innovation, ICT engineers, designers, and content experts can be nurtured on a regional basis.

(iii) Establishment of a startup support platform is required. Expansion of public-private-academic-linked start-up support platforms and support services is required. The key goal of the industrial complex, manufacturing innovation and revitalization of technology startups for the creation of new industries, will depend on a systematic and efficient startup support platform. As it can contribute to the establishment of such a platform in connection with local universities, technology startups are required to support new industries and manufacturing innovations necessary for the revitalization of industrial complexes.

(iv) Support for settlement facilities and infrastructure expansion are required. As the settlement environment such as housing, education, culture, welfare, and sports facilities improves, it becomes easier to secure professional manpower and the quality of life of industrial complex workers increases. .

(v) Expansion of use of B2B marketplace platforms is required. In order to support SMEs' market development and market diversification, it is necessary to promote resident SMEs and provide a global platform service that can introduce information on products, technologies, and cooperation wishes and link them in real time.

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