Post COVID-19, Prospects and Implications of Changes in the Growth Conditions of the IT Industry

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1. Introduction

Up until the beginning of 2020, expectations for a global economic recovery were high due to advances in the fourth industrial revolution (4IR) based on artificial intelligence (AI), data, and the Internet of Things (IoT), the commercialization of 5G worldwide, and large-scale sports events. Contrary to expectations of a recovery, however, a global pandemic caused by the novel coronavirus (COVID-19) is negatively affecting the global economy and industry.

With the spread of COVID-19, global uncertainties are growing and complex shocks are appearing in the real and financial sectors, including economic recession. Production disruptions in production and supply and demand of components are constraining global supply chains, depressing demand and leading to deteriorating corporate profitability. As a result, the IMF predicted in a June 24 announcement that the global economic growth rate would fall by

4.9 percent, 1.9 percentage points below its earlier April forecast.

The global IT industry is also negatively affected by the spread of COVID-19. The release of new products is being delayed due to weak demand, production disruptions and distribution network constraints. On the other hand, due to the spread of non-face-to-face trends such as telecommuting, remote education and increased time spent indoors, online services are expanding, and demand for portable IT products including tablet PCs, smart home device and solid state drives (SSD) is also increasing significantly. As awareness of health and environmental issues improves, demand for IoT-based health and eco-friendly appliances is also on the rise.

On the supply side, major companies have sought to stabilize their production bases and supply chains in order to minimize risks caused by the spread of COVID-19. And the possibility of a reorganization of global value chains and competition structure is expected due to prolonged U.S.-China disputes such as the U.S. sanctions against Huawei. In this situation, internal and external uncertainties are growing as COVID-19 infections are surging worldwide.

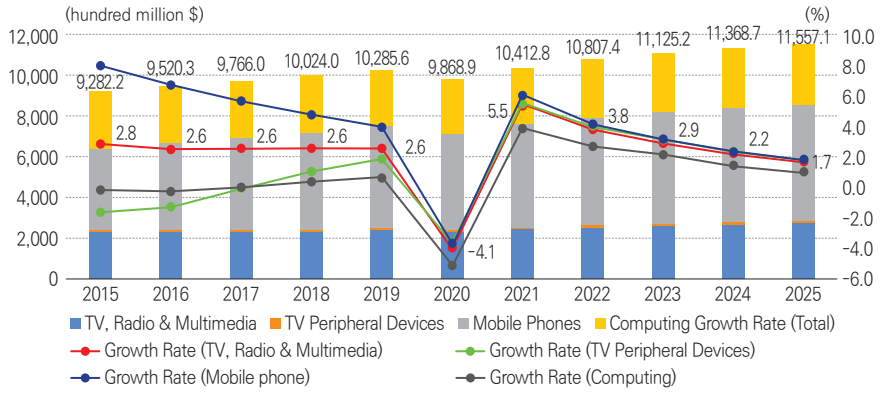
At this point, we look at the impact of the spread of the coronavirus on the global IT industry and predict changes in the growth conditions since the start of the COVID-19 pandemic from a supply and demand perspective. In addition, by diagnosing the status and pending issues of Korea's IT industry at this point, we are looking for ways to grow the domestic IT industry required in the post COVID-19 era.

2. The COVID-19 Pandemic and Global IT Industry Trends

(1) Significant Reduction in Global IT Demand

While the global economy and industry are shrinking significantly due to the spread of COVID-19, the IT industry is also being negatively affected. According to Statista (July 2020), a U.S. market research firm, the global IT industry had grown 2.6 percent annually until 2019, and is expected to decline 4.1 percent in 2020 due to the spread of COVID-19. By sector, it is predicted that the computer and periphery market will fall 5.1 percent and that mobile phones, video and sound devices will shrink 3.7 percent and 3.6 percent, respectively.

Figure 1. Forecast: Market Size of Major Global IT Products



Source: Statista (July 2020).

The global mobile phone market is expected to see a significant drop of 14.7 percent in sales in 2020. Although demands for 5G services which were first commercialized in April 2019 starting in Korea and the United States will play a positive role, global sales of mobile phones are expected to decrease as consumer sentiment falters due to social distancing measures implemented in response to COVID-19, economic recession and reduced income.

It is predicted that the smart home market, which has continued to grow in double digits, will also be affected by COVID-19. The global smart home market grew 29.6 percent year-on-year in 2019, but its growth is expected to slow to 15.9 percent in 2020 due to the global economic recession and weakening demand.

This growth trend is expected to persist given the incrasing number of peo-

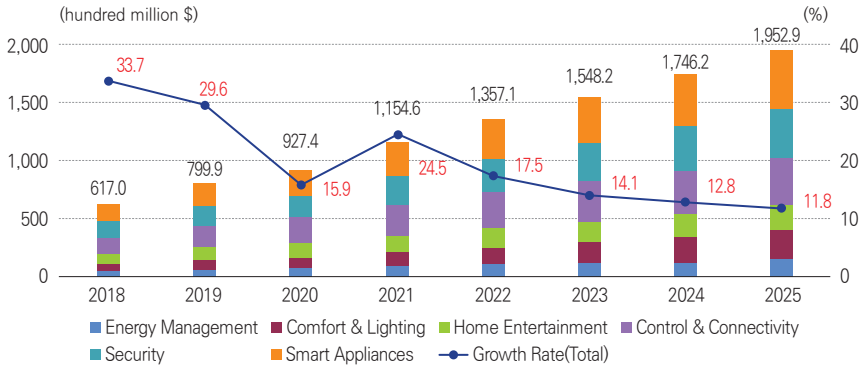
Table 1. Forecast: Mobile Phone Market by Technology

Unit: Sum of Shipments (M), percent

		2018	2019	2020	2021	2022	2023	2024	CAGR (2019~2024)
2G		165.3	111.2	50.6	35.8	33.4	31.3	31.5	-22.3
3G		237.2	178.3	116.1	88.4	62.7	50.6	45.1	-24.0
4G	LTE	1,199.9	1,252.2	1,023.9	899.5	767.6	588.4	421.2	-19.6
	TD-LTE	209.9	195.4	130.2	55.4	11.9	2.2	0	-
5G			16.7	175.1	461.2	699.8	982.9	1,224.5	136.1
Total		1,812.3	1,753.9 (-3.2)	1,495.8 (-14.7)	1,540.2 (3.0)	1,575.4 (2.3)	1,655.3 (5.1)	1,722.3 (4.0)	-0.4

Source: Gartner(July 2020), "Forecast: Mobile Phones, Worldwide, 2018~204, 2Q20 Update".

Figure 2. Forecast: Worldwide Smart Home Market



Source: Statista (August 2020).

ple staying home due to the spread of COVID-19. The smart home market is expected to continue to grow after COVID-19 is contained as demand for voice recognition, AI devices and smart home appliances such as controls, connectors, and smart (AI) speakers increases.

Although the impact is slightly different for each IT category, if the global IT industry was mainly affected by supply disruptions in the early stages of the COVID-19, falling demand has been a particularly negative factor since the second quarter when COVID-19 spread globally, including to the U.S. and Europe. In other words, in the first quarter of 2020, the rapid spread of COVID-19 in China, the world's major manufacturing base, led to the shutdown of plant operations in China, problems in supply and demand of parts and materials and disruptions of logistics and distribution networks. On the other hand, since the second quarter of 2020, demand has been declining due to the influence of social distancing and movement restrictions, remote business and personal activities, the closure of retail stores and reductions in income.

(2) The Spread of Non-face-to-face Online Services

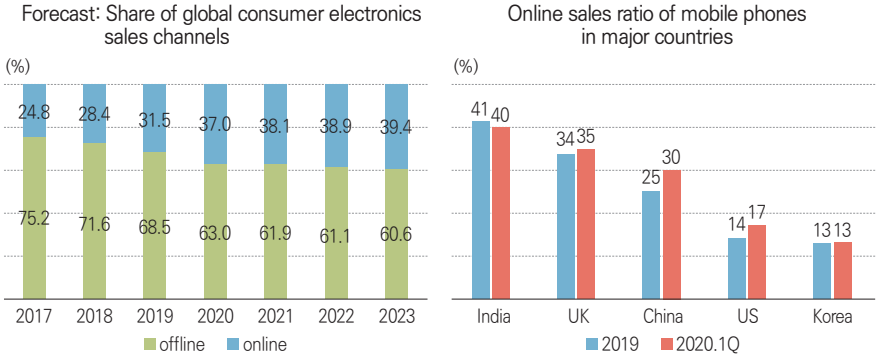
Despite the damage done by the novel coronavirus, it has been associated with some positive developments. First of all, as we saw in the smart home market earlier, online services are expanding as so-called “untact” activities such as telecommuting and remote learning have grown significantly. Demand for offline consumption is decreasing to avoid the risk of COVID-19 infection,

but digitalization is being promoted as online transactions surge. The proportion of online sales is expected to rise to 37 percent in 2020 as online sales in the global consumer electronics market have increased 39 percent year-on-year in 2020. Online sales are also on the rise in the global mobile phone market, which has thus far been relatively dependent on offline sales. In the Chinese mobile phone market, the proportion of online sales increased from 25 percent in 2019 to 30 percent in the first quarter of 2020. The U.S. mobile phone market, which exhibits a strong tendency of offline consumption, saw its share of online sales increase to 17 percent in the first quarter of 2020. The portion of online sales in the global mobile phone market increased from 20 percent in 2019 to 23 percent in the first quarter of 2020 and is expected to increase to 26 percent in 2024.

Second, the market for IT products related to the environment, health and hygiene is growing along with the emergence of the "homeconomy" (Home+Economy) as awareness of those issues grows due to the spread of untact trends. Demand for laptops, tablet PCs, and webcams, which are needed for telecommuting, online education, and shopping is increasing, and demand for smart TVs, clothes dryers, vacuums, air cleaners, and home-health appliances such as digital exercise devices is also increasing.

Third, the spread of COVID-19 is stimulating the digital economy. With the expansion of stay-at-home activities, demand for digital-based IT services including Internet use, video conferencing, online video services (OTT) (for example, Netflix and YouTube) and online shopping and games has increased

Figure 3. Changes in Online Sales Proportion of Major IT Products



Source: Statista (July 2020), Counterpoint (August 2020).

along with demand for related IT products such as smart TVs and mobile devices.

As the data center market expands due to the surge in data traffic, demand for storage devices such as semiconductors and solid state drives is increasing and the need to expand 5G networks is growing. It is in this way that the COVID-19 pandemic is spurring the market for untact services. The digital transformation is accelerating globally through the application of 4IR technologies such as AI, cloud, networks, AR·VR and the expansion of digital infrastructure. In the manufacturing sector, smartification and the digital transformation are also being promoted, with the establishment of a foundation for industrial data utilization and the introduction of AI, 5G-based smart manufacturing and online marketing systems.

3. Current Trends and Future Prospects in Korea's IT Industry

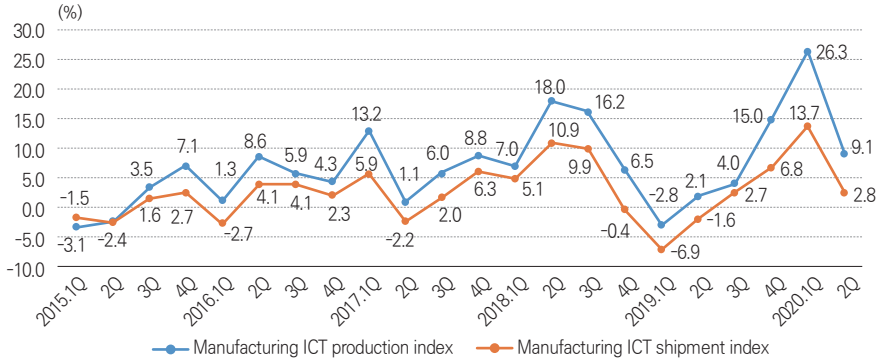
(1) Amid Overall Stagnation, SSD and Home Appliances are Strong

The impact of COVID-19 is negatively affecting production and exports of the domestic IT industry. Until the first quarter of 2020, the IT production indices were trending upward, rising 26.3 percent year-on-year, but the growth rate slowed significantly to 9.1 percent in the second quarter due to the influence of the COVID-19 pandemics. Production of major IT products is expected to decline significantly from the third quarter as COVID-19 infections are again spiking globally, including in the United States and Europe.

In 2019, before COVID-19, Korean IT exports fell 19.7 percent year-on-year. This sluggish performance owes to a decline in global IT demand from the second half of 2018, when the semiconductor boom ended, a fall in semiconductor unit prices, increased overseas production of home appliances and mobile phones and intensified competition with China. Yet given these existing circumstances and the COVID-19 crisis in 2020, IT industry exports fell only 1.2 percent year-on-year until July, greatly slowing the decline.

By industry, the displays fell by 16.9 percent during the same period, and despite strong performance in OLEDs, growing LCD production in China had a negative impact on overall display performance. Wireless communication

Figure 4. Korean Manufacturing Industry ICT Production and Shipment Growth



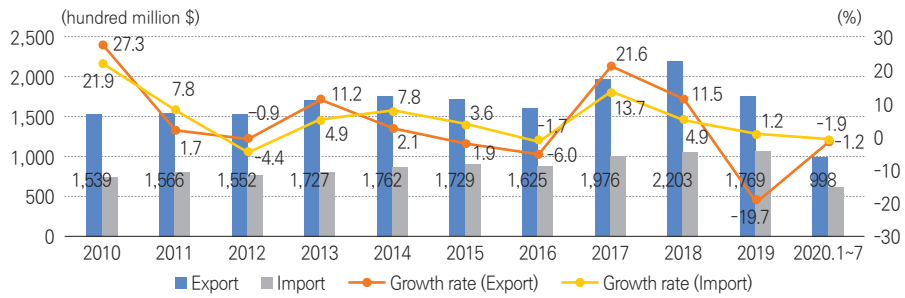
Source: Kosis (2015=100).

devices, including mobile phones, decreased 10.2 percent due to reduced global demand caused by the spread of COVID-19, despite the release of flagship premium phones with 5G and folding screen technologies.

On the other hand, exports of computers and peripherals were up by 73.8 percent as of July 2020 thanks to strong SSD exports due to the surge in untact activities and online services caused by COVID-19. Overall exports of home appliances fell 12.8 percent year-on-year, but exports of cleaning and environmental appliances showed a favorable tendency, with exports of TVs and air cleaners rising sharply and exports of dryers and vacuum cleaners rising 32.7 and 66.9 percent, respectively. Exports of semiconductors fell just 0.6 percent year-on-year as of July of 2020 as unit prices have stabilized amid recovering global demand and demand for data centers.

As COVID-19 spread in China, the world's IT production hub, major IT companies in the U.S. and China, with most of their production capacity lo-

Figure 5. Historical Import and Export Trends in the Korean IT Industry



Source: Ministry of Trade, Industry and Energy (August 2020).

Table 2. Export Trends in Major IT Industries

Unit: million USD, percent

	2015	2016	2017	2018	2019	Jan–July 2020		CAGR (2015~2019)
						export	Growth rate	
Wireless communication device	32,122	28,765	21,450	16,191	13,219	6,476	-10.2	-19.9
PC & Peripheral devices	8,111	8,764	9,602	11,269	9,090	8,107	73.8	2.9
TV, Radio & Multimedia	6,590	5,244	3,791	3,079	4,439	1,591	-43.4	-9.4
Household appliance	4,528	4,344	4,315	3,568	3,604	2,105	-2.5	-5.5
Secondary battery	4,642	5,057	6,026	7,334	7,537	4,140	-5.4	12.9
Semiconductor	62,916	62,225	99,673	128,145	95,161	55,392	-0.6	10.9
Display	32,843	28,098	30,291	27,760	21,837	10,110	-16.9	-9.7

Source: ITSTAT.

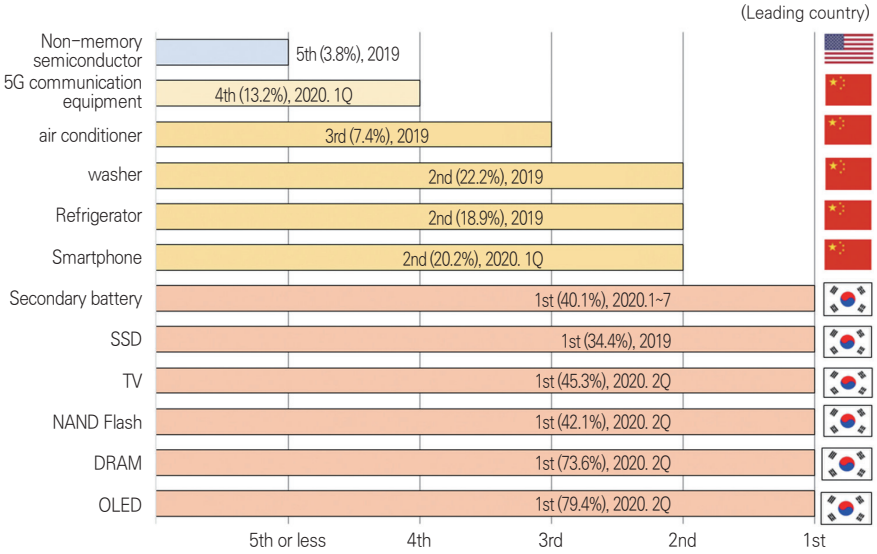
cated in China, suffered setbacks in production and supply of components. Although domestic IT companies also had difficulties, domestic finished products such as home appliances and mobile phones suffered less than global ones due to limited production in China and diversified production subsidiaries in Vietnam and India. However, as COVID-19 spread worldwide beginning in March 2020, the domestic IT industry also began suffering significant negative impacts as demand fell significantly due to entry limitations, quarantine measures, restrictions on movement and the closure of global distribution networks and retail stores.

(2) Diagnosis of Current Issues in Korean IT Industry

Following China and the United States, Korea ranks as the world's third-largest IT industry producer. Although domestic production volumes have fallen due to the expansion of overseas production of major IT products such as PCs, home appliances and mobile phones, domestic IT production volumes topped 123.6 billion USD in 2019, accounting for 6.5 percent of global production. China is the top producer, with 38 percent of the total, followed by the U.S. with 12.7 percent. South Korea and Japan share third place, with 5.8 percent.

The IT industry is the main export industry in Korea, having accounted for 33 percent of manufacturing exports in 2019. The trade surplus is shrinking due to increased overseas production and sluggish exports, but the IT industry accounted for 46 percent (68.4 billion USD) of the manufacturing sector's total trade surplus in 2019, driving the balance of trade surplus.

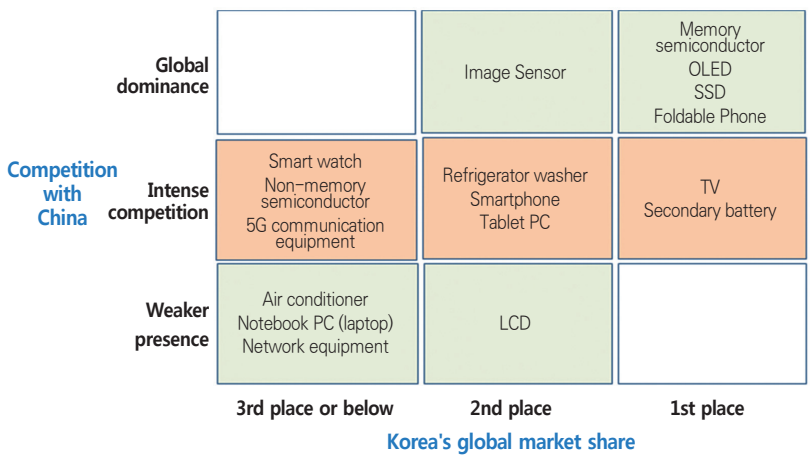
Figure 6. Global Status of Major Korean IT Products



Source: Omdia, Gartner, Dell'Oro, SNEResarch, Korea Display Association, KEA, etc.

Looking at the global market share of major items, which includes TVs, memory semiconductors, OLEDs and SSDs, Korea remains the world's foremost manufacturer. It ranks second to China in smartphones, washing machines and refrigerators. However, competition between South Korea and China is intensifying in the global TV market, and Japan is rapidly chasing the premium TV market, exhibiting an upward trend. Korea's share of the global

Figure 7. Global Competitiveness of Major IT Items



Note: Competitive relations with China mainly reflect the gap in global market share.

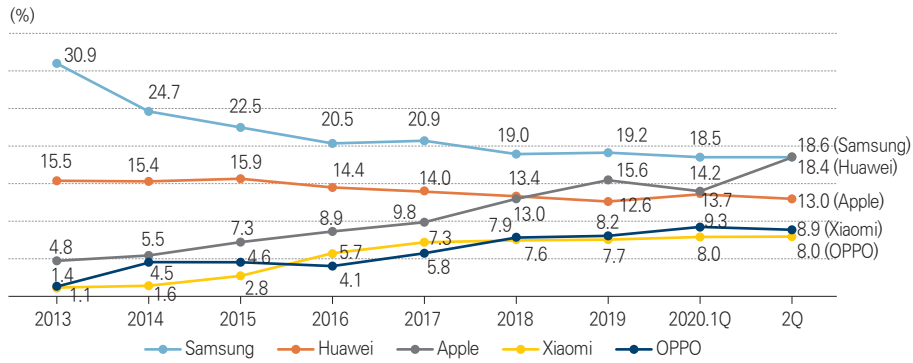
laptop market, which is dominated by China and the U.S., is small. In addition, Korea's global market share of system semiconductors, seen as a core base technology of the fourth industrial revolution and the digital economy, is low, sitting at just at 3.8 percent in 2019.

Although South Korean companies such as Samsung are doing well in the 5G mobile phone and foldable phone markets, Huawei and Samsung Electronics are competing for the world's top rank in the global smartphone market. China is the world's biggest seller of mobile phones by national standards. And while Samsung Electronics briefly occupied the top spot in the initial 5G mobile communication equipment market, as South Korea became the first country to commercialize 5G services in April 2019, it fell to fourth place (a 13.2 percent share) after Huawei (35.7 percent), Ericsson (24.6 percent) and Nokia (15.8 percent).

Korea has the world's best IT and network infrastructure and is widely considered to be globally competitive in IT manufacturing. The country's industrial base produces parts ranging from semiconductors to displays to finished products including mobile phones and home appliances. It is also home to a global leading firm. These are strengths that distinguishes it from other major countries. However, due to a lack of core technologies such as AI and data, constraints on high value-added and qualitative growth of the industry are emerging; Korea is considered to be lagging behind China in these fields.

In addition, the domestic IT industry is still highly dependent on foreign countries due to its weakness in rearward industries such as core materials,

Figure 8. Worldwide Smartphone Market Share by Vendor



Source: Gartner.

Table 3. SWOT Analysis of Korean IT Industry

Strengths	Weaknesses
· Global-level network infrastructure and IT manufacturing capabilities · Home to global leading companies (Samsung, LG, etc.) · World's No.1 in memory semiconductors and OLED competitiveness	· Lack of 4IR tech base · Weak competitiveness in upstream industries such as core material/parts and equipment · Growth structure with high dependence on small IT sector · Insufficiency of systems and regulations
Opportunities	**Threats**
· Accelerating digital transformation and increasing new demand · National brand enhanced in the process of overcoming COVID-19 · Government willingness to foster industry (Korean New Deal, etc.)	· Deterioration of consumer sentiment due to COVID-19 · Possibility of GVC reorganization due to COVID-19 · Large-scale investment and government support in China · Advanced countries dominate global standards and platforms · Long-term U.S.-China technical disputes and the spread of protectionism

parts and equipment. Due to these vulnerabilities, it was attacked by Japan via export regulations on core materials for semiconductors and displays in July 2019. The foundation for domestic industrial development is gradually weakening due to the expansion of overseas production of IT products such as mobile phones, home appliances and PCs. This situation is particularly worrisome for Korea's IT industry because it contrasts with major countries such as the United States that are strengthening their own production bases by promoting manufacturing reshoring. Since August, three data laws, including the Personal Information Protection Act have been in effect and systems and regulations have been improving in various industries, but sentiments at industrial sites are still low.

It is threatening as companies in major countries such as the U.S. and China are pushing for bold investments and M&As to strengthen their core capabilities to lead the market after COVID-19, which will feature high growth and structural changes. However, it is expected that Korea will be able to seize new opportunities for growth if it proactively responds to the spread of online services, digital conversion trends, and structural changes that are being promoted based on the strength of the IT industry.

4. Future Prospects and Policy Implications

(1) Post-COVID-19, Prospects for Structural Change in the IT Industry

As mentioned earlier, the global supply and consumption structure of the IT

industry is expected to change with the COVID-19 pandemic. First of all, as risk in global supply networks increases, it is expected that de-globalization will proceed. This is because the need for diversification and stabilization of supply chains has increased as major IT companies suffered from suspended plant operations, disruptions in parts procurement and severance of distribution networks due to the spread of COVID-19 in China, a global production hub. Global IT companies such as Apple, HP, and Google are already planning to relocate to Southeast Asia such as Vietnam or are increasing their production share. Samsung Electronics withdrew all of its mobile phone factories in China in 2019 and recently shut down its TV factories in China. LG Electronics is also cutting production in China. In addition, the prolonged U.S.-China conflict is increasing uncertainty and the spread of protectionism is raising the possibility of a change in the global division of labor.

At the same time, due to changes in global industrial conditions and trade environment, U-turn (reshoring) movements are visible in major countries such as the U.S. which are trying to reduce their dependence on foreign countries by setting up supply chains such as production bases and procurement in their own countries. In response, Korea has recently strengthened its U-turn policy by providing U-turn companies by supporting technologi-

Figure 9. Post COVID-19, Changing Forecast of Global Supply and Consumption Structure

Global supply chain	De-globalization (Globalization → Localization)	- De-China movement (diversification and stabilization of suppliers and producers) Prolonged dispute between the U.S.-China → Reorganization of the international division of labor
Industrial and Trade order	Strengthening of domestic manufacturing	- Promote manufacturing U-turn (reshoring) and spread smart manufacturing - Prolonged U.S.-China disputes, protectionism, and spreading digital trade
Technology	Smart and Digital transition acceleration	- Promotion of technological development for industrial intelligence and realization of a non-face-to-face digital society - Digital transformation and establishment of related infrastructure (5G, non-face-to-face platforms, etc.)
Consumption Structure	Generalization of Non-face-to-face Online services	- Expansion of online shopping and education, telecommuting, and stay-at-home activities - Increased awareness of convenience/health/hygiene - Expansion of customized personalization trend

cal development, assisting in automating processes and offsetting the cost of building smart factories but has yet to show any tangible results.

Next, as untact and online service trends continue, changes in consumption structure are expected. In other words, with the spread of COVID-19, demand for non-face-to-face services such as telecommuting, video conferencing, remote classes, online shopping, and OTT has increased and these technologies are expected to become common after the COVID-19 era.

Along with this non-face-to-face trend, the demand structure of the IT product market is expected to change as consumers' perceptions of environmental issues, health and hygiene changes. As mentioned earlier, markets for IoT-based health and clean living appliances, smart homes and home appliances, AR·VR devices, and tablet PCs are expected to grow. Not only in the consumer market but also at the industrial level, smartization and digital transformation will accelerate based on AI, data, and 5G, stimulating the construction of related infrastructure and the development of supporting technologies.

(2) Policy Implications

Korea's IT industry is once again at a crossroads due to the COVID-19 incident that swept the world in early 2020. If Korea fails to respond to the impact of the internal and external economic slump and changes in the global supply and demand structure, Korea's IT industry will be left behind, and if it responds quickly to the post COVID-19 era, where the emphasis will be on non-face-to-face, online (remote), and digital technologies, it will have a chance to take a leap forward.

Although the country is facing threats that include increased uncertainties caused by COVID-19 and changes in the global economic and industrial order, it should cope with them well and respond to the growth period of the global IT industry after COVID-19. If the situation stabilizes quickly post-COVID-19, we should prepare for the possibility of a global surge in investment and market demand from companies that have delayed doing so until now. While maximizing the strength of Korea's IT industry and supplementing its weaknesses, Korea should take advantage of the current situation as an opportunity to become an advanced IT country through drastic innovation.

First, we need to expand the future growth base of our IT industry. First of all, it is necessary to support and cultivate companies that are the main drivers of growth and innovation in the IT industry. In the short term, it is necessary to expand funding targets and strengthen tax benefits to prevent promising domestic IT firms suffering temporary production disruptions or management difficulties from falling behind. In the mid- to long-term, it is necessary to build a structure that can produce globally-innovative companies and it is also critical to foster non-face-to-face online services and products that began growing due to COVID-19 and incubate specialized companies with innovative digital technologies and infrastructure. Possible targets for such support policies include next-generation devices and equipment, AI home appliances, flexible products and core components. But it is urgent to produce global companies in innovative fields that do not yet exist. This can be done by creating a startup ecosystem that produces unicorn companies in promising IT fields and new digital technologies.

Second, it is important to foster upstream sectors, which are a weakness of the Korean IT industry, to expand the foundation for future growth. In other words, we need to create a high-value industrial ecosystem through bold and strategic development of key materials and components in the IT industry. Based on this, Korea should be able to become a major global IT supplier. For this purpose, cooperation between large and small businesses and joint efforts by industry, academia and research organizations are essential.

We should also seek to strengthen the foundation of the domestic IT industry, which is weakening due to the expansion of overseas production of IT finished products such as home appliances and mobile phones. It seems necessary to prepare for the possibility of reorganizing the global supply chain by re-analyzing future risks due to the COVID-19 crisis and the U.S.-China conflict. In order to strengthen location conditions, it is necessary to expand the intelligent infrastructure of smart industrial complexes using ICT. In other words, it is crucial to expand the domestic growth and investment conditions of the IT industry by establishing a smart infrastructure that combines 5G networks, AI and data, IoT and cloud computing as base technologies. This will also promote the U-turn(reshoring) of overseas companies and foreign investment.

Third, support for the development and commercialization of core 4IR and

digital transformation technologies should be expanded. In the IT industry, continuous and preemptive investment in future core technologies is essential. Preemptive investment and support are needed to secure convergence of new technologies in fields such as AI and IoT, as well as core and original technologies in next-generation fields such as 6G networks. Moreover, it is necessary to drive the growth of promising products such as intelligent health and IoT home appliances, household robots, next-generation smart devices and intelligent sensors and to expand and support commercial R&D, certification, and demonstration bases for timely commercialization and market creation of developed products. It is also necessary to reinforce market dominance in the future through discovering new business models and platforms that respond to new demands for non-face-to-face IT products such as smart home and smart connected devices. It is predicted that competition between South Korea and China will expand beyond the existing IT product market to new promising IT products in the post COVID-19 era. In this regard, product differentiation is required through changes in the global value chain and IT product structure in the post-COVID-19 era and constant innovation to cope with the digital era.

Fourth, it is required to strengthen support measures to boost sluggish domestic demand due to the spread of COVID-19. Measures need to be taken to boost domestic demand by providing support for products feared to miss sales targets due to the COVID-19 crisis through increased public procurement and the expansion of the government's budget for reimbursing the purchase of energy-efficient home appliances and the scope of applicable goods. It can also be considered a way to boost domestic consumption by seeking support for online sales channels and strengthening online marketing for small and medium-sized companies.

Fifth, we need to expand the IT infrastructure required in the post COVID-19 era. It is necessary to speed up the establishment of the 5G national network and commercialization of the standalone(SA) 5G network and 28GHz band mobile communication and for this purpose government support is required. This is because 5G infrastructure is at the core of both the Fourth Industrial Revolution and the Digital New Deal. Although construction of a 5G national network and in-building upgrades are being delayed due to restric-

tions on entering and leaving buildings and social distancing guidelines, an early establishment of a 5G network is also important for improving domestic demand and strengthening global competitiveness. In addition, it is necessary to establish a foundation for collecting and utilizing IoT and cloud bases and data as a basis for the digital transformation and IT advancement, which requires government support.

Finally, institutional and regulatory improvements that are required in the digital and online era and conform to the global level should be pursued continuously. As an example, it is also necessary to security and safety standards for smart home devices and service and to proactively discover systems and regulations for new IT convergence industries. The new IT industry needs to further strengthen and support a regulatory expedited processing system, given that it is difficult to predict technology and market changes and that there is a limit to finding preemptive regulations.

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