

The Fourth Industrial Revolution in Major Countries and Its Implications of Korea: U.S., Germany and Japan Cases

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I. Introduction

In the 1990s the world witnessed the Information Technology (IT) revolution, which entirely changed the paradigm of the global economy. IT has since continued to develop and mobile platforms have become one of the most important markets, represented by the rise in e-commerce and the sharing economy. At the 2016 World Economic Forum, Klaus Schwab emphasized the rapid pace of technology advancement and used the phrase “Fourth Industrial Revolution” to illustrate how such advanced technologies are being applied to change the business paradigm once again. In the fourth industrial revolution, technological innovations are applied to manufacturing systems to enable the mass customization of various products. Governments, especially in advanced economies, are striving to adjust to this change in the paradigm and environment of business. This brief focuses on policies implemented in response to the fourth industrial revolution unfolding within major advanced economies such as the U.S., Germany and Japan, and their implications for the Korean government.

II. Main Strategies of Advanced Economies for the Fourth Industrial Revolution

1. United States

The United States is a well-established global leader of advanced technologies. The U.S. government’s efforts to prepare for the upcoming era began during the previous administration. The Obama administration announced a Framework for Revitalizing American Manufacturing in December 2009, revealing its intention to strengthen its competitiveness in manufacturing via innovative technology. The framework was further developed into the President’s Plan to Revitalize American Manufacturing announced in July 2012 as a part of the strategy to support the development of advanced manufacturing technology. The plan was accompanied by the establishment of the National Network for Manufacturing Innovation Program, which connects research institutes that promote next state-of-the-art technology. The government selected eleven key next-generation technologies that are expected to lead the next-generation tech-

nologies, such as 3D printing, nanotechnology, and robots. Moreover, the U.S. government set up the National Network for Manufacturing Innovation (NNMI) in 2012 to establish a network that could connect academia, research institutes and industry players across the country, and thus support the development of state-of-the-art technologies.

Although the United States government has not laid out comprehensive overall strategies or policies to face the fourth industrial revolution, it is preparing for the new technology era by introducing new legislation or guidelines that address, among other concerns, the areas of personal data protection, data security, and autonomous vehicle systems. Moreover, the government has invited private players to participate from the planning stage of government projects, thus promoting active private participation.

One of the key factors enabling the U.S. to lead the global technology trend is its start-up ecosystem. The U.S. start-up ecosystem is led by private players, especially its advanced venture capital system. To further strengthen this system, the U.S. government launched the Startup America Initiative in 2011, with a particular focus on bolstering entrepreneurship by: 1) facilitating start-ups' access to capital; 2) expanding mentorship programs; 3) ensuring easier entry to create new businesses; 4) accelerating commercialization; and 5) promoting access to markets in medicines, clean energy, and education.

2. Germany

The German version of the fourth industrial revolution is known as "Industrie 4.0". Germany includes all stakeholders of Industrie 4.0 in a platform called Plattform Industrie 4.0 (Plattform). The Plattform was originally

launched by three major German industry associations, BITKOM, ZVEI and VDMA, in 2013 to share their ideas to promote the fourth industrial revolution. Realizing that Industrie 4.0 needed to cover social issues, the three associations decided to hand over leadership to federal government ministries.

The Plattform is a central figure for promoting Industrie 4.0 and now has five working groups engaged in the following topics: 1) Reference architectures, standards and norms, 2) Research and innovation, 3) Security of networked systems, 4) Legal framework, and 5) Work, education and training. Reference architecture is the one of the factors that Plattform considers to be essential in achieving the vision of Industrie 4.0. Its working group created the Reference Architecture Model Industrie 4.0 (RAMI 4.0) to define each technology which is involved in developing Industrie 4.0, in terms of standards. As the boundaries between industries become more and more ambiguous due to industry convergence, often exemplified by the Internet of Things (IoT), the German platform considered standardization to be important. Plattform is also striving to internationalize RAMI 4.0 in relevant fields.

Germany is known for its "hidden champions," successful small and medium enterprises (SMEs) that are industry leaders but less known compared to multinational companies. However, as most SMEs lack the resources to be competitive in the digital economy, the federal government of Germany seeks to support SMEs by utilizing its network established via Plattform. In line with these efforts, the federal government has created Excellence Competence Centers that convey key technologies to SMEs.

3. Japan

Japan designated the fourth industrial revolution policy as a priority national focus area in 2015 within its growth strategy announced by the Japanese government. In part to promote the vision of “Society 5.0”, the Robot Revolution Initiative (RRI) and IoT Acceleration Consortium (ITAC) were launched in 2015 and the Council on Investment on the Future was established in the following year as a control tower for the Japanese Growth Strategy. The Japanese government divided the basic strategies for the fourth industrial revolution into two categories: demand-side and supply-side. By utilizing innovative technologies, e.g. artificial intelligence (AI), and big data, demand-side strategies aims to develop new demands and supply-side strategies that concentrate on the creation of new products and services.

The Japanese government has set goals for some of the basic strategic sectors. In the Smart Mobility sector, the government set the timely goal to commercialize autonomous vehicles and drones, based on levels established by the government. Japan is utilizing areas within its National Strategic Special Zones, where regulations are less stringent compared to normal districts, as the test-bed for autonomous vehicles and drones. Smart Supply Chain (Smart Manufacturing) is one of the five main strategic sectors to implement Society 5.0. Japan is seeking to develop a “Real Data Platform” via international cooperation, to set up the system for companies to utilize the data under fair and unconstrained circumstances, and to support SMEs in their adoption of IoT.

III. Policy Implications

1. Establishment of Organization for Omnidirectional Cooperation

Traditionally, governments supported specific industries mostly by granting subsidies, authorizing tax credits, or facilitating finance to increase the competitiveness of relevant companies. However, boundaries among the industries are breaking down under the fourth industrial revolution and traditional government aid may not have as much effect as before. Advanced economies are responding to this change by allowing more room for business activities themselves through the reform of regulation and systems. In addition, corporations are responding to the trend as they cooperate across industries with open innovation systems.

Korea, including the government and industry players, must consider establishing a platform that can develop a network among all stakeholders involved in the fourth industrial revolution. Moreover, such a platform is essential for international cooperation as many other countries are seeking to identify opportunities amidst the fourth industrial revolution. The structure and methodology to build up such a platform can be benchmarked from other countries. The Industrial Internet Consortium (IIC) is led by global conglomerates with whom industry players cooperate to develop new business models, using state-of-the-art technologies as they fully bear their own risk. On the other hand, the Japanese RRI and ITAC are led by the government, making it easier for companies to identify policy directions and the competition status of certain technologies or industries. At the same time, working within these frameworks may lead to a lack of transparency when it comes to companies sharing information regarding their

own technology status. Germany's Plattform Industrie 4.0 includes all the stakeholders, even labor unions, which is very ideal, but patience will be the key to set up such a platform when considering its time-consuming process.

2. Reform of Regulation and Systems

Countries are reforming their regulations and systems to be more flexible for new business models and technologies that will become feasible during the process of the fourth industrial revolution. The Korean government recognizes the need for regulation reform and tries to follow up such trends as they announce some of the plans for system adjustments. However, such plans are not implemented yet as relevant legislations are not passed in the parliament.

Since the environment for commerce is changing as the international community is adapting to different circumstances, Korean companies should also be aware of the heightened geopolitical risks involved with investing in China. Deeper trade conflict between the U.S. and China may deter Korean companies from advancing into the Chinese market. In addition, geopolitical risks may have negative impacts on Korean companies located in China. For example, the deployment of the Terminal High Altitude Area Defense (THAAD) system in South Korea has led to Korean businesses experiencing disadvantages in China.

Changes in the Chinese market itself are another factor that Korean companies should recognize. China was once called a global manufacturing factory for its low-cost labor, but the wage level in China is on the rise and labor is not as attractive as before. At the same time, this escalation in wages is leading to an increase in China's purchasing power, meaning that Korean companies may target Chinese consumers by developing and exporting high

value-added products to China.

3. SME Support

Since the fourth industrial revolution requires digitalization along the entire value chain, the key focus is on inducing SMEs, who are normally suppliers, to digitalize their systems as they lack the information, networks, and financial means of large corporations. And the need for SMEs to participate in the digitalization process would prompt changes in government policies to support them. In the case of Germany, the German government created "Mittelstand 4.0" and brought it under its Industrie 4.0 program to manage its SME supporting system in an efficient manner. The government is also operating "Excellence Competence Centers", which provide opportunities for SMEs to test next-generation technologies and figure out how to adjust in their own businesses. Japan's policies concentrate on developing a platform for the data collected through IoT, so that such data can be shared by other SMEs to facilitate key data.

The main point for SME policies for the fourth industrial revolution would be incorporating preexisting SME support policies into the new supporting system. The Korean government is currently implementing various SME supporting policies, including those in the area of technology, R&D, and financing. Yet, the government must identify how it will effectively support SMEs in regard to the fourth industrial revolution so that it can reorganize the current system and create a new supporting system if necessary.

4. International Cooperation

Due to the fact that most countries lack sufficient knowledge when it comes to preparing for upcoming technologies and industries, international cooperation will be essential for the

fourth industrial revolution. Germany's Plattform is pushing forward to work with the Industrial Internet Consortium, Japan, China and other EU countries in the area of standardization, best practices, technology exchange, etc. Germany is also interested in cooperating with Korea, but Korea needs a main representative that can promote international cooperation. Moreover, Korea needs to identify fields in which it can encourage cooperation with other countries. Korea should consider designating or establishing an organization that is in charge of actions related to the fourth industrial revolution, which can also promote international cooperation. **KIEP**