

Industry 4.0 in China, Japan and ROK, a Leading Regional Cooperation in the Globalized World



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— **Akima UMEZAWA** In 2011, Germany created the term “Industry 4.0” in order to deliver strong influence on the concurrent and emerging technologies, which will positively affect the economy as a new social system. While Industry 4.0 is a good movement for development, it also has social significance and implies a shift of the economic system. Thus, this session will focus on analyzing recent developments of Industry 4.0 or innovation in the three countries of China, Japan and Korea; the direction that the three countries are heading to; and how the three countries should cooperate to lead the economy in the global society.

— **CHENG Nan** The background to “China Manufacturing 2025” has external and internal factors. The exponential changes that have happened along with the new industrial revolution were closely related to manufacturing process. The change of the ecosystem has led Internet and manufacturing to converge with each other, and new business such as Internet banking is on the rise. Innovation model has also changed and smart manufacturing has been spreading. These changes have brought about a customization of organization structure. The external changes

also let internal changes. As the growth pace of China slows down, the country enters into the New Normal, and economic development is facing challenges including lack of resources, rising labor cost, sluggish export and decreasing competitiveness of the investment. The Chinese government has carried out reforms and proposed goals, one of which is One Belt, One Road initiative.

China Manufacturing 2025 consists of two pillars of smart manufacturing and promoting productive Internet. Internet will be the drive for innovation. Various innovative models and micro innovations are creating synergies. Towards the goal of smart manufacturing, China should create an ecosystem to enhance the quality of Chinese manufacturing. Two kinds of capability enhancement are needed. First, for the manufacturing industry to innovate itself, innovation centers are being constructed. According to the goals of China Manufacturing 2025, 15 innovation centers will be constructed across the nation by 2020. Second, given that 90 percent of the state of the art facilities are imported and that some countries have banned exports of major facilities to China, basic industrial capabilities need

to be strengthened in order to ensure quality. The government will pursue this through four key points of intelligent manufacturing, green manufacturing, advanced manufacturing and service-oriented manufacturing. One of the goals of China Manufacturing 2025 is to leverage with other countries and adopt foreign investments. The Chinese government has adopted more open policies that target large and foreign companies, as well. As President Xi Jinping said at Davos Forum, trade protectionism is putting oneself in the dark room where you cannot breathe the air or enjoy the sunshine. Going forward, China will work with more international companies.

— **Shunsuke MANAGI** All countries, including China, Japan and Korea, have similarities on the topics of smart city, smart housing, artificial intelligence and big data. Countries should focus on making strengths even stronger. Last year, there was an average of 18 percent stock market price increase in Japan, largely deriving from trading companies. The trend of big companies moving to investment is becoming a new business model. In the era where industrial structure is changing rapidly, what will make the difference in the future is the ability to quickly change business if necessary.

Retail, automobile and electric industries experienced a decrease in the stock market, due to a decrease in individual sales and high Japanese yen compared to U.S. dollar. Some automobile industry is investing on collaborations with bigger universities. Prime Minister Abe has proposed a new target of Society 5.0, following the historical development of society from hunting, agriculture, manufacturing and information. It is important to note that the core strategy for Japan’s future economic growth focuses on artificial intelligence and data. By artificial intelligence, it means that new fields will be connected by data through computer science.

The reality in Japan is that very few international students come to Japan for their studies, and very few also go out, when compared to other countries such as the U.S., Canada and Sweden. Given that the country’s population will decrease by 200,000 per

year, Japan faces the challenge of a larger demand of robotics in medicine and construction. One of Japan’s strengths is the technology assessment for research and development. It is much easier now to access various experts’ viewpoints from different disciplines, and collaboration of engineering with other social science fields has made R&D mechanisms more efficient. Besides, data accumulation as well as the uses of hydrogen as a buffer to assure energy security is also areas that Japan is good at. Artificial Intelligence(AI) and big data can create benefits that people may not have realized yet. AI does not decide its own objectives. Japan is good at basic science such as mathematics and physics, and these disciplines can contribute to AI in a relatively small budget. Using new ideas and connecting this to engineering in a smarter way will bear more benefit to the Japanese society, and this can also be a good contribution of Japan to the world.

— **KANG Hakju** The concept of smart factory is considered by many businesses around the world and the attention seems to center on smart factories for Small and Medium Sized Enterprises(SMEs).

The manufacturing sector is determining criteria to assess the competitiveness of a nation. The labor-intensive manufacturing sector in Asia has lost its momentum in the past few decades, and the achievement of Germany regarding its High-tech Strategy 2020 has led many companies to conduct researches on smart factories. The platform for Industry 4.0 has been designed and implemented for big businesses that are agile, and it requires large investments that SMEs do not have access to. Such model is prevalent around the world, but the percentage of SMEs in the manufacturing industry in the world and in Asia is 81.6 percent and percent, respectively. SMEs face challenges with outdated facilities, manual labor production system, and costs.

Smart factory is for production efficiency, support to the management to make rational decisions, reasonable operation and enhancement of competitiveness. The concept of smart factory needs to provide data collection methodology, analysis function, and

ability of monitoring the improvement of production process. It is only after these process are taken that SMEs can think about automation and system integration.

New technologies such as big data and crowd sourcing have significantly reduced the cost burdens of SMEs in connecting data created at operating systems to the Information Technology(IT) system. There is no need to replace existing equipment and it can be rapidly installed. However, it is crucial to make sure that laborers are able to apply the new technologies at ease. Industry 4.0 is emerging in all parts of the world and the smart factory should be embraced at national level, not only by the manufacturers. In doing so, close attention must be paid to the needs of the small businesses. Three recommendations are SMEs should be able to adopt a new platform at a low cost; the platform should be easily adaptable; a large number of software developers are needed, and the data protocol as well as applicable standards should be adequate to a given country or region.

— **KIM Jeong-Gon** The second industrial revolution has changed human history when the steam engine was applied to other industries and create rapid innovations. During the third industrial revolution, it was believed that computers would replace manual labor, but now in the era of digital revolution and innovation, AI is replacing intellectual labor as well. For example, it is intellectually challenging to think about how Alpha Go was able to analyze a large set of data in such a short span of time. Machines are also able to make judgments on their own. While AI has a set of limitation, it can be applied to manufacturing as well. For China, Japan and Korea, pursuing digital innovation in the manufacturing sector will have a significant impact on the economy. In Japan, what are the considerations made with regards to the changes in the labor market under Society 5.0? In Korea, what should Korean government do given the current situation? In China, under the all-encompassing transformation strategy of Internet Plus, what are the concerns about the labor market and

unemployment?

— **Akima UMEZAWA** Looking back into history, the first industrial revolution gave rise to capitalism and social divide between the rich and the poor. The birth of the global market in the second industrial revolution meant that people who had mass production power governed the market, and the emergence of IT created digital divide. There is the negative impact that Industry 4.0 gives to countries and the world. What are the policies in China, Japan and Korea to fill such social or economic gap between the haves and the have nots?

— **KANG Hakju** Korea plans to establish 10,000 smart factories by 2020. While this manufacturing innovation 3.0 seems effective in many regards, Korean policy focuses primarily on the quantity of growth and the support systems are not well-connected. The Korean government should focus on a long-term approach to achieve quality improvement, and there is a lot we can learn from Japan and Germany. The German model is meaningful because while the government takes the leading role, the actual power is delegated to other players including universities, research institutions and regional communities. In Korea, power is concentrated in the center. Regarding the social divide, core technologies can reduce the digital divide.

— **Shunsuke MANAGI** China, Japan and Korea should not compete in areas that are led by Germany and the U.S. The target for Japan will be medical care and construction, both domestic and international. There is a concern on compensating human labor with robotics, and survey results show that if technologies are cheap enough, people are happy with it. Further experiments on technologies is necessary. Japan proposed two approaches to tackle the social divide. One is basic income system as social safety net, and the second is making higher education less expensive. This is expected to make it easier for people to go back to school when they are looking for a job.

— **CHENG Nan** A revolution is something that affects our lives and cultures. This is why Japan has introduced the concept of Society 5.0, and why China

has introduced Internet Plus. China Manufacturing 2025 is also about capital, human resources and culture. Chinese companies are lacking human resources. Given the development gaps in the regions, companies' needs of talents are very diverse. With the spread of ICT, companies need people with expertise. In the next ten years, the number of university graduates will outnumber the total population. If China is able to better use this, with the back up of infrastructure, there will be benefits.

— **Akima UMEZAWA** How should three countries strengthen cooperation to tackle the social gaps emerging from Industry 4.0?

— **KIM Jeong-Gon** While technologies take away some jobs, it will also create new jobs. China, Japan and Korea should jointly establish an ecosystem for digital economy.

— **CHENG Nan** Chinese people are also starting more projects to create businesses and jobs. Each country has its competitive edge, which should be the basis of trilateral cooperation.

— **KANG Hakju** The three countries should not compete against each other, but should be able to share technology and data to further promote Industry 4.0 together. It is important to open discussion to overcome regulatory challenges, and this will also help solve issues regarding labor market.

Keywords

Industry 4.0, Manufacturing, Trilateral cooperation



Policy Implications

- Various social and economic impacts of Industry 4.0 can be addressed for CJK not through competition, but through win-win collaboration based on each country's comparative strengths.
- Areas that three countries need to collaborate include: establishment of an ecosystem for digital economy; and open discussion to overcome challenges on regulations, standardization and technological compatibility. Trilateral cooperation can be an engine to promote Industry 4.0, and can also contribute to the challenge of labor market.
- Education is the key to address social and economic gaps emerging from the Fourth Industrial Revolution. National policies to provide continuous education through more flexible education systems will lead to strengthen worker's capabilities.