Section 2  Development of resilient supply chains and evolution of human communication

As indicated by the analysis in Chapter 1, as a result of the novel coronavirus disease (COVID-19) pandemic, production was suspended and the movement of people and goods was restricted, resulting in supply chain disruptions. This situation could be disadvantageous for Japan, which has an advantage in integration work based on free international economic activity and communication. Therefore, it is necessary to first transform supply chains into resilient ones that can flexibly respond to new crises. To that end, it is essential to work out solutions adapted to the type of goods, facilitate smooth cooperation between the public and private sectors and shift the priority of supply chains from efficiency to flexibility.

The COVID-19 pandemic has also been a crisis of face-to-face communication. In the future, various lifestyles premised on face-to-face communication are expected to change considerably. Therefore, it is necessary to evolve the way of human communication by taking advantage of technology.

1. Development of resilient supply chains

(1) Supply chains’ vulnerabilities exposed by the COVID-19 pandemic

Because of the COVID-19 pandemic, supply chain disruptions took place worldwide, and shortages of emergency goods, such as medical supplies, occurred amid explosive expansion of demand. This revealed the need to reconsider the balance between economic efficiency due to the concentration of production and capacity to respond to supply disruption risk. It also indicated that if sufficient preparations are not made for crises and if international cooperation does not function adequately in emergencies, it is difficult to ensure stable supply.

The importance of preparation in normal times and response to emergencies has also become clear. As demand for medical supplies, such as masks and respirators, expanded at an explosive pace, the supply of emergency goods did not catch up with the demand in some cases. On the other hand, in normal times, it is unrealistic to prepare sufficient supply capacity to meet explosive expansion in demand for all sorts of emergency goods. Therefore, it is important to take actions suited to each of normal times and emergencies.

In light of the abovementioned viewpoints, the direction to be taken in strengthening supply chains will be considered below.

(2) The direction to be taken in developing resilient supply chains

Therefore, as to the direction to be taken in developing resilient supply chains, there are the following three key points: considering solutions adapted to the type of goods, promoting cooperation between the public and private sectors that enables flexible response to a crisis, and shifting the priority of supply chains from efficiency to flexibility.

(A) Considering solutions adapted to the type of goods

First, it is necessary to consider solutions adapted to the type of goods. While cross-border supply chains have been developed, shortages of goods have occurred due to explosive expansion of demand and supply chain disruptions during the COVID-19 crisis.

Whereas it is difficult to focus exclusively on pursuing maximization of efficiency, it is also important to take advantage of the benefits of existing supply chains. Therefore, it is essential to work
out solutions tailored to the type of goods. It is necessary to first assume situations that could create supply bottlenecks for various sorts of goods in accordance with their respective usage and properties and to hold detailed discussions on what measures should be taken to resolve the bottlenecks according to the type of goods (Figure II-3-2-1).

First, regarding emergency goods for which demand expands at an explosive pace in emergencies, such as masks, protective clothing, vaccines, respirators, tents and blankets, it is not feasible in normal times to hold sufficient capacity for such emergency demand. Therefore, as a complementary measure, it is important to develop a stable system that is resilient to the effects of international situations. Flexible international cooperation in a crisis is required to complement such systems. In the future, it will continue to be necessary to develop more broad cooperation with various regions. For example, on April 17th, Japan and ASEAN jointly announced the ASEAN-Japan Economic Ministers’ Joint Statement on Initiatives on Economic Resilience.

Next, regarding industrial goods with cross-border supply chains and for important industries supporting Japan, it is necessary to maintain the right balance between efficiency and stable supply in competitive areas in ordinary times because supply bottlenecks may occur in emergencies. To that end, it is important to accurately comprehend supply chain networks and develop systems that are resilient to disruptions by diversifying procurement sources.

Furthermore, regarding goods with physical constraints in domestic production capacity, such as food, energy and mineral resources, it is important to enhance the security of food and energy through measures such as diversifying procurement sources and securing international logistics options.

With respect to goods for which it is necessary to ensure stable supply from a security perspective, it is important to improve economic security by strengthening domestic systems and cooperating with many countries.

**Figure II-3-2-1  Conceptual picture of measures based on the types of goods**

<table>
<thead>
<tr>
<th>Emergency goods</th>
<th>[Challenge] Demand increases explosively during a crisis. It is not feasible to have and maintain full capacity for such emergency demand in peacetime.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- To construct stable supply system in case of emergency, which is not affected by international affairs.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other goods</th>
<th>[Challenge] Supply shortage occur in case of crisis. We should maintain balance between efficiency and stable supply in competitive area while the world is peace.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Important industries supporting Japan with cross-border supply chains (auto, electronic machinery and parts, materials, etc.)</td>
<td>- Constructing a system hard to break by comprehending the choke points precisely and procuring materials from many countries.</td>
</tr>
<tr>
<td>Strategic supplies with physical constraints in domestic production (food, energy, important minerals)</td>
<td>- Enhancing the security of food and energy (supply chain diversification)</td>
</tr>
<tr>
<td>Review of supply chain from a security perspective is needed (sensible technology, emerging technology)</td>
<td>- Improving Economic Security by strengthening domestic systems and cooperating with many countries.</td>
</tr>
</tbody>
</table>
(B) Cooperation between public and private sectors that enables flexible response in times of crisis

Moreover, amid the COVID-19 pandemic, public and private sectors engaged in flexible cooperation in various countries.

The Trump administration of the United States requested private-sector companies to manufacture emergency goods under the Defense Production Act, while the EU is promoting the development of medicine production by private-sector pharmaceuticals companies through the provision of funds to the European Federation of Pharmaceutical Industries and Associations and the Innovative Medicines Initiative (IMI). In Japan, the Ministry of Economy, Trade and Industry and the Ministry of Health, Labour and Welfare are jointly requesting cooperation from economic associations in order to increase domestic production of medical goods and facilitate new entry into the medical goods manufacturing industry. At the same time, Bureaus of Economy, Trade and Industry in each region launched a consultation service to explain support measures necessary for increasing the production of medical goods (e.g., capital investment support measures). In addition, outside Japan, some companies voluntarily manufactured disinfectants and artificial respirators and other companies produced emergency goods in response to their governmental requests (Figure II-3-2-2).

Figure II-3-2-2  Examples of public-private collaboration

<table>
<thead>
<tr>
<th>Country-by-country examples of response measures through public-private collaboration</th>
<th>Examples of response measures by companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>◆ Utilization of the Defense Production Act (U.S.)</td>
<td>[Examples of companies’ voluntary response measures]</td>
</tr>
<tr>
<td>The Act aims to provide designated individual companies with mobile support measures for allocation of resources in priority-rated orders and expansion of production infrastructure. It also aims to promote cross-sectoral collaboration in procurement of medical supplies and other goods in emergencies.</td>
<td>□ A sports-equipment manufacturer produced personal protective equipment, such as face masks and face shields.</td>
</tr>
<tr>
<td>◆ Public-private partnership-based support measures between the pharmaceutical industry and the EU governments</td>
<td>[Response measures under the Defense Production Act]</td>
</tr>
<tr>
<td>The EU is promoting the development of pharmaceuticals by private-sector pharmaceuticals companies through the provision of funds to the “Innovative Medicines Initiative (IMI),” a public-private partnership between the European Federation of Pharmaceutical Industries and Associations and the EU. The provision of funds has been increased from 45 million euro to 72 million euro.</td>
<td>□ An automobile-related company made a contract concerning artificial respirators with the U.S. Department of Health and Human Services and produced related parts.</td>
</tr>
<tr>
<td>◆ Measures for supporting business matching of companies providing cooperation in increasing their production (Japan)</td>
<td>□ A medical equipment manufacturer made a contract concerning artificial respirators with the U.S. Department of Health and Human Services and increased the production.</td>
</tr>
<tr>
<td>The Ministry of Economy, Trade and Industry (METI) and the Ministry of Health, Labour and Welfare are jointly requesting cooperation from economic associations for an increase in domestic production of medical goods and new entry into the business of manufacturing medical goods. At the same time, Bureaus of Economy, Trade and Industry at each regions have opened the consultation services to explain support measures necessary for increasing production of medical goods (e.g., capital investment support measures).</td>
<td>□ The U.S. government exercised an export restriction over N95 masks, etc. to Canada. The government temporarily conflicted to mask manufacturers, but later, it permitted exports of the masks to Canada.</td>
</tr>
</tbody>
</table>
(C) Shifting the priority of supply chains from efficiency to flexibility

Cross-border production systems have been developed in pursuit of the efficiency of supply chains. In this situation, supply chain disruptions occurred in relation to production systems, the movement of goods, and the movement of people. In emergencies, various risks materialized, including countries’ tendency to prioritize their domestic needs. On the other hand, new moves, such as utilizing digital technology, have emerged amid the COVID-19 pandemic.

Given what happened globally, it is necessary to strengthen the resilience of supply chains in a way that maintains competitiveness so that flexible response can be made in emergencies.

To strengthen the resiliency of supply chains, it is important to accurately comprehend the structure supply chain networks and specify essential parts and materials.

Developing production systems while utilizing digital technology in both normal times and emergencies is expected to allow for redundancies through improved efficiency and to enable manufacturers to keep track of the status of supply chain disruptions in real time in emergencies.

With respect to the optimal allocation of production bases, diversifying supply sources is expected to reduce supply disruption risk in normal times, and changing procurement sources is expected to enable manufactures to secure alternative goods promptly and flexibly in emergencies.

(a) Accurately comprehending supply chain structure

In order to strengthen the resiliency of supply chains in light of the balance between supply chains’ economic efficiency and capacity to respond to supply disruption risk, it is important to accurately comprehend the structure of the supply chain.

Supply chain networks change in accordance with changes in production locations and countries’ comparative advantages, and the requirements for supply chains differ according to the nature of goods.

In the Global Value Chain Development Report 2019 published by the WTO in April 2019, a network of global trade in value added for all goods and services is described in Figure II-3-2-3. In 2000, Japan served as one of the hubs in the network of global trade in value added and had many neighboring Southeast Asian countries in the value chain. However, in 2017, Japan was no longer a hub but was one of the countries neighboring China. In 2017, Germany, China and the United States were the three largest hubs, with Japan, as well as Southeast Asian countries, neighboring China in the value chain.

Figure II-3-2-3  Network of trade in value added for all goods and services (supply side; upper figures: 2000; lower figures: 2017)
Notes: This figure shows a topology based on the data on trade in value added in 35 sectors of 62 countries and regions. Focusing on the intermediate input of the entire goods and services in the respective countries, the arrows start from the partner country and end at the target country if the target country highly depends on the partner country. The bidirectional arrows refer to the situation where the target country and the partner country highly depend on each other. Multiple arrows start from multiple partner countries and end at the target country if the target country highly depends on the multiple partner countries at the same level.

Source: Liet al. (2019).

However, as shown in Figure II-3-2-4, in the network of trade in value added concerning ICT goods, Japan still served as a hub in 2017. While Thailand, Bangladesh, and Indonesia neighbor Japan, Taiwan, which is another hub, also had a close linkage with Japan. The Philippines was a neighboring country of Taiwan. Although the Republic of Korea (ROK) was also a hub, its position was distant from Japan, but it had a close linkage with Viet Nam. China also served as a hub and had a certain degree of linkage with Japan, the ROK and Taiwan. China also had a linkage with the United States and Germany. Japan, the ROK and Taiwan were linked with the United States and Germany through China. Therefore, for Japan to increase ICT trade with the United States, Europe, the ROK and Viet Nam through complex trade networks, China is an indispensable partner. On the other hand, for China to increase ICT trade transactions with Thailand, Bangladesh and the Philippines through complex trade networks, Japan and Taiwan are indispensable partners.

As shown by the trade of IT products, Japan is linked with other East Asian and Southeast Asian countries in complex networks. Regarding automobiles, too, not only a network of intra-industry trade but also a trade network involving a broad range of industries have been developed. There are moves to diversify production locations to Southeast Asia not only among Japanese and ROK companies but also among Chinese companies. It is necessary to consider the balance between supply chains’ economic efficiency and supply disruption risk after accurately comprehending the structure of supply chain networks.
Notes: This figure shows a topology based on the data on trade in value added in 62 countries and regions. Focusing on the intermediate input of the entire goods and services in the respective countries, the arrows start from the partner country and end at the target country if the target country highly depends on the partner country. The bidirectional arrows refer to the situation where the target country and the partner country highly depend on each other. Multiple arrows start from multiple partner countries and end at the target country if the target country highly depends on the multiple partner countries at the same level. The network of trade in value added for complex ICT goods focuses on the networks of trade in value added for electric machinery subject to intermediate input in the general machinery, electric machinery and transportation machinery sectors.

Source: Liet al. (2019).

(b) Diversification of procurement sources

Diversifying procurement sources and securing an appropriate level of inventories are also effective strategies for increasing the resiliency of supply chains

Under a lean production OEM (original equipment manufacturer) strategy, companies avoid holding surplus inventories of raw materials and intermediate goods, minimize the number of factories, and outsource production without owning factories of their own, depending on the circumstances. This
strategy delivers a high return in normal times by enabling companies to focus on their areas of strength and save cost. On the other hand, this strategy involves the risk that a shortage of inventories of parts and other goods may cause production to come to a halt in the event of an emergency, such as an infectious disease pandemic or a natural disaster. Meanwhile, building up inventories and diversifying production locations lowers the return in normal times but reduces risks associated with emergencies. Below, the status of inventory buildup and production location diversification will be examined.

It was before the global financial crisis, when the global economy maintained stable growth that the trend of not holding inventories strengthened in manufacturing industries worldwide. Later, after the global financial crisis, the inventory ratio fluctuated up and down. In the 2010s, the inventory ratio in manufacturing industries trended upward worldwide (Figure II-3-2-5). The inventory ratio in U.S. manufacturing industries rose moderately while economic expansion lasted for a long period of time. The inventory ratio in ROK and Taiwanese industries showed a downward trend through the middle of the 2000s but rose later. The inventory ratio in Japanese manufacturing industries rose and fell steeply in 2009 in response to the global financial crisis and indicated an upward trend in the second half of the 2010s.

In the electronic parts sector, the inventory ratio in the ROK and Taiwan, which fell in the 2000s, continued to decline later and still remains at a low level (Figure II-3-2-6). On the other hand, the inventory ratio in the United States rose slightly in the 2010s and showed a downward trend from 2015 onward. The inventory ratio in Japan rose steeply.

**Figure II-3-2-5  Inventory ratio in manufacturing industries in the U.S., Japan, the ROK and Taiwan**

Notes: Japan’s inventory ratio in manufacturing industries in or before 2007 was retroactively estimated, based on the linked indices.

Source: U.S. Department of Commerce, METI, Statistics Korea, Ministry of Economic Affairs, R.O.C.
Figure II-3-2-6  Inventory ratio in electronic parts industries in the U.S., Japan, the ROK and Taiwan

Notes: The data on Japan show those on the electronic parts and devices industries. Japan’s inventory ratio in electric parts and devices industries in or before 2007 was retroactively estimated, based on the linked indices.

Source: U.S. Department of Commerce, METI, Statistics Korea, Ministry of Economic Affairs, R.O.C.

The inventory ratio regarding transportation equipment stayed stable in Japan. In the United States and the ROK, it declined in the 1990s and the first half of the 2000s, and rose later (Figure II-3-2-7).

Figure II-3-2-7  Inventory ratio in transportation equipment industries in the U.S., Japan, and the ROK

Notes: Japan’s inventory ratio in transportation equipment industries in or before 2007 was retroactively estimated, based on the linked indices.


In light of the above, the electronic parts industry in the ROK and Taiwan, in which companies continued to avoid holding large amounts of inventories for many years, may have become highly
vulnerable to shocks caused by supply chain disruptions. On the other hand, in the transportation equipment industry, which experienced two major supply chain disruptions, at the time of the Great East Japan Earthquake and the floods in Thailand, both of which occurred in 2011, companies started to build up a certain amount of inventories in the following years.

While shortages of goods might have been avoided during the COVID-19 pandemic if the inventory ratio were high, the possession of inventories involves a trade-off with cost. There is also the risk that stocked products may become obsolete.

At the time of the Kumamoto Earthquake in 2016, the production of digital cameras was affected by the shutdown of a Japanese electronics maker’s main factory for image sensors. Based on this lesson, this company’s semiconductor division formulated a broad BCP (business continuity plan) intended to prevent supply chain disruptions, including by holding inventories sufficient to restore factory operation in two months, in times of similar natural disasters. This example is a business division that has a high global share, and not all business divisions of the company have similar BCPs.

Possessing inventory requires funds, and if inventories of products remain unsold, there is a high risk of a price fall. In some cases, companies develop a system to secure inventories and procurement promptly, rather than building up a large amount of inventories as a preparation for crises. For example, an IT company in the U.S. partially shifted outsourced production of computers and mobile phones from China to Vietnam. This is an example of diversification.

Meanwhile, Japanese manufacturers have production networks that include the sharing of inventories between different production locations. As a result of the experience of the Great East Japan Earthquake in 2011, Japanese automakers have developed the preparedness to identify the status of inventories and factory operation at the third and fourth sub-contractors as necessary. In addition, from the lesson of a parts shortage caused by the concentration of production of key parts, such as engine-controlling microcomputers, at one factory of a particular subcontractor, the automakers have diversified procurement sources. The manufacturer of engine-controlling microcomputers that was affected by the earthquake strengthened a substitute production system six months after the disaster by diversifying production locations and using external factories. The company also introduced an inventory control system that can meet individual client companies’ respective needs.

Among Japanese companies as a whole, there is a trend of diversifying overseas business locations. According to the Basic Survey of Japanese Business Structure and Activities, the number of companies owning overseas subsidiaries and affiliates fell to 5,810 in 2018 for the second straight year of decline. On the other hand, the number of overseas subsidiaries and affiliates remained on an upward trend and increased to 49,162 (Figure II-3-2-8). As a result, the number of overseas subsidiaries and affiliates per company increased to 8.5 in 2018 from 8.1 in 2017 (Figure II-3-2-9).

While the number of companies operating abroad is slightly declining, those companies are establishing more and more overseas business locations. Between 2013 and 2018, the number of

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81 According to statistics concerning U.S. durable goods order receipts in January 2020, the total amount of inventories in the whole of U.S. manufacturing industries was worth 1.74 months of sales. By industry, the amount of inventories was worth 1.57 months of sales for computer-related products and 0.65 months of sales for automobiles.
overseas business locations increased in many industries. The number increased in such industries as business oriented machinery, transportation equipment, chemicals, production machinery, information and communication equipment, and electronic parts/devices but decreased in such industries as leather products, lumber, ceramics, textiles, and metal products.

**Figure II-3-2-8**  Number of Japanese companies owning overseas subsidiaries and affiliates and number of overseas subsidiaries and affiliates

<table>
<thead>
<tr>
<th>Number of companies</th>
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**Figure II-3-2-9**  Number of overseas subsidiaries and affiliates per Japanese company operating abroad

In the food, chemicals, and metal products industries, the number of local affiliates owned by Japanese companies is higher in ASEAN10 than in China (limited to mainland China), mainly because of a decrease in the number of local affiliates in China (Figures II-3-2-10 and II-3-2-11). In the electric machinery and information and communication equipment industries, the number of local affiliates is still higher in China than in ASEAN10, but in the transportation equipment industry, the number of local affiliates is higher in ASEAN10 than in China.

Figure II-3-2-10  Number of overseas affiliates of Japanese companies in the food, chemicals and metal products industries (Survey on Overseas Business Activities)

Source: Survey on Overseas Business Activities (METI).

Figure II-3-2-11  Number of overseas affiliates of Japanese companies in the electric machinery, information and communication equipment and transportation equipment industries (Survey on Overseas Business Activities)

Source: Survey on Overseas Business Activities (METI).

As described above, in Japan, the inventory ratio rose and production locations became diverse in some industries.
While the inventory ratio was used in the above analysis, the number of months in inventory, which indicates how many months of shipments or sales the existing inventory is worth, is regarded by manufacturing industries as an important index in many cases. The average number of months in inventory in manufacturing industries is 1.3 to 1.4 months in both Japan and the United States. However, the number varies from industry to industry.

In the United States, the number of months in inventory is high for civil aircraft, at longer than 8 months, for mining equipment, at 3.6 months, and for computers, at 2.8 months. On the other hand, the number of months in inventory is low, or less than one month, for light trucks, passenger cars and auto parts (Figure II-3-2-12). Among the factors that caused shutdowns of automobile factories in the United States in the second half of March and thereafter may be the low number of months in inventory in addition to the complexity of supply chains. Regarding non-durable goods, the inventory level is high for beverages and apparel and is low for food, chemicals and packaging paper products.

In Japan as well, the number of months in inventory is low, less than 0.5 (less than half a month of sales), for automobiles and auto parts compared with other industries. The number of months in inventory is also low for printing, food, pulp/paper/paper products, and information and communication equipment. On the other hand, the number of months in inventory is high for chemicals, production machinery, nonferrous metals, textiles, steel, and other transportation equipment (aircraft and ships). In non-manufacturing industries, the number of months in inventory tends to be low due to the properties of the goods and services involved. The number of months in inventory is around 1 (worth around one month of sales) for retail trade and higher than 1 (worth more than one month of sales) for construction, agriculture, forestry, fishing, and real estate (Figure II-3-2-13).
Figure II-3-2-12  Number of months in inventory to sales in the U.S. manufacturing industry
(December 2019)

Inventory to monthly sales in the durable goods sector in the U.S. manufacturing industry

Inventory to monthly sales in the non-durable goods sector in the U.S. manufacturing industry

Source: U.S. Department of Commerce.
Figure II-3-2-13  Number of months in inventory to sales in major Japanese industries (2019)

Inventory to monthly sales in Japanese manufacturing sector

- Miscellaneous transportation equipment: 3.25
- Iron and steel: 2.45
- Textiles: 2.35
- Nonferrous metals and products: 2.08
- Production machinery: 2.01
- Manufacture of chemical and allied products: 2.00
- Business-oriented machinery: 1.94
- General-purpose machinery: 1.82
- Ceramics, stone and clay products: 1.61
- Lumber and wood products: 1.53
- Petroleum and coal products: 1.52
- Manufacturing: 1.42
- Metal products: 1.38
- Electrical machinery: 1.36
- Information and communication equipment: 1.31
- Pulp, paper and paper products: 1.22
- Others: 1.18
- Food (aggregated results): 0.82
- Transportation equipment (aggregated results): 0.59
- Motor vehicles, parts and accessories: 0.46
- Printing and allied industries:

Inventory to monthly sales in Japanese non-manufacturing sector

- Real estate: 2.49
- Fisheries: 2.49
- Agriculture and forestry: 1.80
- Miscellaneous transport: 1.67
- Construction: 1.55
- Scientific research and professional and technical services: 0.96
- Non-manufacturing: 0.92
- Retail trade: 0.86
- Wholesale: 0.69
- Mining and quarrying of stone and gravel: 0.61
- Gas, heat supply and water: 0.43
- Miscellaneous services: 0.40
- Information and communications: 0.34
- Education, learning support: 0.33
- Electricity: 0.29
- Medical, health care and welfare: 0.28
- Water transport: 0.25
- Miscellaneous goods rental and leasing: 0.23
- Accommodations: 0.18
- Land transportation: 0.16
- Eating and drinking services: 0.15
- Living-related and personal services: 0.14
- Amusement services: 0.12
- General goods leasing: 0.11
- Advertising: 0.11
- Pure holding companies: 0.10
- Employment and worker dispatching services: 0.10

Notes: The data in the figure shows monthly sales derived from the division of the quarterly sales by three.

In addition, in order to promote supply chain diversification, “Glocal Growth Strategy” is also important. “Glocal Growth Strategy” refers to the supply of products and services by local companies through direct transactions with global markets. This contributes to supply chain diversification and the growth of local companies in Japan at the same time.

Furthermore, it is important to develop emergency supply systems as a complementary measure. During the COVID-19 pandemic, shortages of emergency goods, such as masks and artificial respirators, occurred. As it became difficult to identify the supply-demand balance promptly and delays occurred in the procurement process, the status of inventories in the market became unclear. In this situation, anxiety grew among consumers, leading to demand expansion due to the hoarding of goods.

In light of this situation, one effective option is to take advantage of digital technology to create a situation in which accurate information can be collected even in emergencies. That will also lead to appropriate procurement and inventory management, and it could also assist with the accurate comprehension of supply chains and the diversification of procurement sources.

2. Evolution of human communication

Amid the COVID-19 pandemic, irreversible social changes have occurred. One example is the changing way of human communication, as exemplified by an increase in online communication. This has something in common with the third unbundling. On the other hand, as the importance of face-to-face communication is being recognized anew, the change is providing an opportunity to reconsider the way of communication.

(1) Face-to-face communication: experiences of past epidemics of infectious diseases

At present, face-to-face communication is being put at risk amid the COVID-19 pandemic, with cross-border movement of people declining. Cross-border human mobility slowed down due to travel restrictions imposed in countries around the world. Between January and March 2020, the number of international tourists fell by more than 80%, while the number of air travelers dropped by more than 70%.

This is not the first international epidemic of an infectious disease. At the time of the Asian influenza epidemic in 1957, real household expenditure on air travel services in the United States in that year increased by 12.9% year-on-year but the growth rate slowed down considerably by 0.1% in 1958. At the time of the Hong Kong influenza epidemic in 1968-1969, real household expenditure on air travel service in the United States recorded year-on-year increases of 20.8% in 1968 and 18.3% in 1969, but the growth slowed down significantly by 0.4% in 1970 (Figure II-3-2-14).

Figure II-3-2-14  Changes in household expenditures on air travel services in the U.S. (calendar year; month-on-month, in real terms)

Notes: The monthly values and the quarterly values in the figure are those released in and after January 1959 and those released in and after the January-March period in 1959, respectively. The vertical bars in gray refer to the situations after: the Asian influenza epidemic in 1957, the Hong Kong influenza epidemic in 1968-1969, the multiple terrorist attacks in the United State in September 2001, and the outbreak of the Iraq war in March 2003.

Source: U.S. Department of Commerce.

Among examples of infectious disease epidemics since the 2000s are the severe acute respiratory syndrome (SARS) epidemic in 2003 and the Middle East respiratory syndrome (MERS) epidemic in 2015. Figure II-3-2-15 shows the numbers of in-bound tourists in East Asia before and after the onset of those epidemics.

When SARS infections spread in the spring of 2003, mainly in Hong Kong and Guangdong Province, the numbers of in-bound tourists in East Asia declined between March and May 2003, with the number in Hong Kong dropping by 67%. This epidemic affected neighboring countries and regions, causing the number of in-bound tourists to fall by 35% in the ROK, by 27% in Japan and by 26% in China in May 2003. Before the WHO declared the containment of the SARS epidemic in July 2003, the number of in-bound tourists in East Asia, including Hong Kong, started to recover. In August of the same year, the number of in-bound tourists in Hong Kong recovered to the level seen before the onset of the SARS epidemic.

When MERS infections spread in the ROK in May 2015 and thereafter, the number of in-bound tourists declined by 55% in the ROK and by 9% in China between April and July of the same year. The number of in-bound tourists increased by 8% in Japan and by 3% in Hong Kong, indicating a shift in tourist flow from the ROK. It was in March 2016 that the number of in-bound tourists in the ROK recovered to the level seen before the onset of the MERS epidemic. On the other hand, the effects of this epidemic on neighboring countries and regions were limited.
In light of the above, although the number of tourists and demand for air travel declined steeply or the growth rate declined significantly in the short term in response to infectious disease epidemics many times in the past, they recovered after the containment of epidemics.

How did infectious disease epidemics affect the flows of migrants? Below, the situations before and after the Spanish influenza epidemic in 1918-1919, the Asian influenza epidemic in 1957, and the Hong Kong influenza epidemic in 1968-1969 will be examined.

Figure II-3-2-16 shows the combined number of immigrants to the United States, Canada, Brazil, and Argentina from the second half of the 19th century through the first half of the 20th century (on a flow basis; the same applies hereinafter). The number of immigrants to these countries in the five-year period from 1916 to 1920 was 1.58 million people, down steeply from 4.14 million people in the five-year period from 1911 to 1915. This indicates that the decline in the number of immigrants coincided with the period of the Spanish influenza epidemic, but the effects of World War I, which broke out in 1914, contributed to the decline.
As for the annual number of immigrants to the United States, it fell significantly after the start of World War I, declining from 1.22 million in 1914 to a quarter of that number, or 300,000, in 1917 (Figure II-3-2-17). In 1918, when the Spanish influenza epidemic started, the number fell to 110,000 immigrants but recovered to 140,000 in 1919 and 800,000 in 1921. Later, the number fell 59% year-on-year to 290,000 in 1925, after the entry-into-force of the Immigration Act of 1924. Moreover, after the onset of the Great Depression in 1929, the number of immigrants dropped to a tenth of the previous level in the first half of the 1930s.

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83 Keeling (2014) pointed out the introduction of quotas and regulations regarding immigrants and an increase in people seeking political asylum following August 1914, immediately after the start of World War I.

84 This law restricted the flow of immigrants by imposing upper limits on the numbers of immigrants from Japan and Eastern and Southern Europe.
At the time of the Asian influenza epidemic in 1957 and the Hong Kong influenza epidemic in 1968-1969, the number of immigrants slowed down temporarily. The number of immigrants to the United States fell by 23% year-on-year in 1958. In 1969, the number of immigrants to the United States dropped, as was the case in 1958, recording a year-on-year fall of 21%. However, in 1959 and 1970, the number of immigrants rebounded.

Later, the number of immigrants to the United States grew moderately throughout the 1970s and 1980s, and following the end of the Cold War, it increased significantly in 1991. Although the number of immigrants increased in 2001, when the multiple terrorist attacks in the United States occurred, it decreased by 34% year-on-year in 2003, when the Iraq war took place. In 2008, after the onset of the global financial crisis, the growth in the combined number of immigrants to all OECD member countries slowed down, but the growth in the number of immigrants to the United States did not.

As described above, the flows of immigrants were curbed significantly by such factors as wars, immigration restrictions and the Great Depression, but the effects of infectious disease epidemics were not necessarily strong and they were short-lived.

(2) Technology-based evolution of the way of human communication

As a result of the COVID-19 pandemic, travel restrictions have been introduced in all countries, and the strictest restrictions in history have been imposed on cross-border human mobility. According to a survey conducted by the U.N. World Tourism Organization (UNWTO), which has analyzed the status of travel restrictions since January 30th, when the WHO declared the COVID-19 epidemic to be a “Public Health Emergency of International Concern, national borders were completely or partially...
closed to tourists at 45% of the 217 tourist destinations around the world, international flights were completely or partially cancelled at 30% of them and entry of passengers who came from particular countries or came via particular destinations was banned at 18% of them.  

Cross-border human mobility has become a major factor supporting the development of the global economy since the 2000s by promoting intellectual exchange through exchange of highly skilled workers, by promoting tourism in various countries through increases in flows of tourists and by enabling companies to employ foreign workers, including immigrants, in many countries. However, as a result of the COVID-19 pandemic, more strict restrictions may continue to be imposed for a while due to the strengthening of quarantine measures intended to prevent the spread of infections in countries around the world.

Even in this situation, value added, which has continued to be created through human mobility, should continue to be pursued in various ways, depending on the circumstances. To that end, it is necessary to evolve the way of communication by using remote technology and to promptly hold discussions on allowing the resumption of cross-border human mobility, starting with workers with essential skills, after taking quarantine measures.

New initiatives, such as replacing overseas business trips with web conferences, using e-commerce, and shifting business meeting fairs to the digital format, are growing. For example, JETRO is striving to open new sales channels for products made by local small and medium-size enterprises (SMEs) through the establishment of “Japan Mall” sites at major foreign EC sites and developing an environment that enables companies to hold business negotiations remotely without face-to-face communication by promoting online trade exhibitions and business meeting fairs that substitute for physical ones. At a time when the needs for cross-border e-commerce are expanding, business opportunities for local SMEs and medium-ranking firms, which do not necessarily have overseas business locations, are expected to increase. The Glocal Growth Strategy is important from this viewpoint, too.

Those initiatives require rule-making concerning cross-border data flows more strongly. Therefore, it is important to realize free and open data flows with consumer and business trust by promoting the Data Free Flow with Trust (DFFT).

In addition, a further diffusion of online interactive services, which have been increasing in recent years, is expected to change economic activity in services sectors, including medical services, private tutoring schools, and sports.

In Japan, where the time spent by people on moving around is long, there is room for a significant change in work and school commuting time. The national average of commuting time for male workers in 2016 was 72 minutes. By location of residence, the average was long in the Tokyo metropolitan area as follows: 84 minutes for male workers living in Saitama Prefecture, 91 minutes in Chiba Prefecture, 81 minutes in Tokyo and 95 minutes in Kanagawa Prefecture. Meanwhile, the national average of commuting time for female workers was 51 minutes. By location of residence, the average was long in the Tokyo metropolitan area, as was the case for male workers, as follows: 55 minutes for female workers living in Saitama Prefecture, 61 minutes in Chiba Prefecture, 59 minutes in Tokyo and 65

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85 “100% OF GLOBAL DESTINATIONS NOW HAVE COVID-19 TRAVEL RESTRICTIONS, UNWTO REPORTS” (UNWTO).
minutes in Kanagawa Prefecture.

Because a long time is spent on commuting, particularly in the Tokyo metropolitan area, as described above, sufficient time is not secured for sleep and leisure in Japan.\textsuperscript{86} The possibility has been pointed out that if the time for sleep were increased, productivity may improve.\textsuperscript{87}

Therefore, in Japan’s case, it could be possible to secure more time for sleep, housework and other activities by reducing commuting time through the use of online communication, including telework and remote learning.

Under the Telework Days campaign (implemented in July each year), which has been promoted by the Ministry of Internal Affairs and Communications since 2018, the number of commuting workers in Tokyo’s 23 wards decreased by around 250,000, or 8.9%, on a special campaign day (July 24th) in 2019. Some 80% of the participants cited “the reduction of the time spent by workers on movement” as a benefit of the implementation of the Telework Days campaign.\textsuperscript{88}

According to an international survey conducted in March 2019, the proportion of companies that had introduced telework was 69% in the United States, 68% in the United Kingdom, 80% in Germany, and 51% in China, while the proportion in Japan was 32%. On the other hand, 80% of Japanese people expect the introduction of telework as a new employment style, indicating a wide disparity between the actual introduction rate and expectations (Figure II-3-2-18). Therefore, there are expectations for further expansion of economic activity using online communication as a countermeasure against the COVID-19 pandemic.

![Figure II-3-2-18 Percentages of people expecting the introduction of telework and those of companies that have introduced it (survey in March 2019)](image)

Source: The IWG Global Workspace Survey.

\textsuperscript{86} Mishima (2018), Kuroda (2012), and Abe (2010).
\textsuperscript{87} Ono (2016).
\textsuperscript{88} Ministry of Internal Affairs and Communications (2019).
Table II-3-2-19 shows the status of use of face-to-face communication and interactions by type of economic activity. In many industries, face-to-face communication is required in many cases.

However, the necessity of face-to-face interactions is expected to decrease in the transportation service industry due to the use of drones, in the construction and utilities (electricity, gas and water) industries due to remote operation, and in manufacturing industries due to the use of robots and factory automation. Although there are many economic activities requiring face-to-face interaction in the entertainment and real estate industries, online services, represented by e-sports, and “real estate tech” are gradually developing.

As described above, the use of e-commerce, interactive services, and telework could change various social and economic activities. Economic activities can be conducted without face-to-face communication as a prerequisite in the distribution industry through the use of e-commerce and in the financial services, business services, public services, information services and communication industries through the use of telework and the provision of online services. In particular, there is ample room for using digital technology to make social changes in megacities, as indicated by the much larger share of the distribution industry, financial services, business services, public services, information services and communication industries in the creation of value added in Tokyo than the nationwide average share of those industries.

As described above, the use of technology makes it possible to address the problem of rising face-to-face communication cost, with which the world is confronted amid the COVID-19 pandemic.

While digitalization is accelerating amid the COVID-19 pandemic, the effects of restrictions on person-to-person contact differ from industry to industry. Therefore, restrictions on face-to-face interactions intended to prevent infections and the third unbundling trend may cause irreversible changes in social life, leading to a dramatic transformation of industrial structures. From now on, as the world may enter an era in which only essential face-to-face communication is conducted, it is necessary to view the current crisis as an opportunity for social change and take advantage of it to evolve the way of human communication.

**Table II-3-2-19  Need for face-to-face communication by type of economic activity**

<table>
<thead>
<tr>
<th>Economic activities with face-to-face communication as a prerequisite</th>
<th>Economic activities not necessary with face-to-face communication as a prerequisite</th>
<th>Share in the creation of value added in Tokyo (FY2016)</th>
<th>Share in the creation of value added in Japan (FY2016)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction industry</td>
<td>Construction</td>
<td>Designing and remote management</td>
<td>5.5%</td>
</tr>
<tr>
<td>Manufacturing industry</td>
<td>Factories</td>
<td>Utilization of robots and automatization of factories</td>
<td>8.8%</td>
</tr>
<tr>
<td>Industry</td>
<td>Category</td>
<td>Delivery Services</td>
<td>Drone-based Delivery Services</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>--------------------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Transportation service industry</td>
<td>Delivery services, passenger transportation and cargo transportation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribution industry</td>
<td>Supermarkets, department stores and convenience stores</td>
<td></td>
<td>E-commerce and delivery services</td>
</tr>
<tr>
<td>Financial industry</td>
<td>Physical stores</td>
<td></td>
<td>Telework and online services</td>
</tr>
<tr>
<td>Real estate industry</td>
<td>Commercial real estate, and management and operation of real-estate properties</td>
<td></td>
<td>Imputed rent, rental housing and real estate technology</td>
</tr>
<tr>
<td>Business services, and government services</td>
<td>Face-to-face services and contact counters</td>
<td></td>
<td>Telework and online services</td>
</tr>
<tr>
<td>Information service industry and communication industry</td>
<td>Face-to-face services and contact counters</td>
<td></td>
<td>Telework, online services and call centers</td>
</tr>
<tr>
<td>Amusement industry</td>
<td>Physical stores and venues</td>
<td></td>
<td>Online services</td>
</tr>
<tr>
<td>Accommodation industry</td>
<td>Physical stores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eating and drinking industry</td>
<td>Physical stores</td>
<td></td>
<td>Parcel-delivery services</td>
</tr>
<tr>
<td>Medical care</td>
<td>Hospital beds, medical examinations and medical treatments</td>
<td></td>
<td>Home or remote medical examinations</td>
</tr>
<tr>
<td>Education</td>
<td>Educational facilities</td>
<td></td>
<td>Online education</td>
</tr>
</tbody>
</table>

Notes: “Annual Report on Prefectural Accounts” provides the data on categories of “miscellaneous services” and “accommodations, eating and drinking services.” However, since the data on “amusement,” “accommodation” and “eating and drinking” industries are not provided separately in the report, “Updated Input-Output Table” was also used to adjust differences of industrial category. Regarding the amusement industry, the ratio of the output of “amusement services” was calculated in the total output of 3 categories (“laundry, beauty and bath services,” “amusement services” and “miscellaneous personal services”) based on the data in the list of 96 sectors in the “2016 Updated Input-Output Table.” The value of amusement industry in Tokyo was calculated by multiplying the ratio mentioned above and the value of “miscellaneous services” under the Annual Report on Prefectural Accounts (on the premise that the ratios are the same in Tokyo and in whole country).

Regarding the “accommodations” and “eating and drinking” industries, the data on
“accommodations, eating and drinking services” in “Annual Report on Prefectural Accounts” was divided into these 2 industries by the similar method. The ratios of the output of 3 related categories (“accommodations,” “eating and drinking” and “food take-out and delivery service”) were calculated in the total output of them, based on the data in the list of 506×386 sectors in the “2016 Updated Input-Output Table.” The values of “accommodations” and “eating and drinking” industries in Tokyo were calculated by multiplying the relevant ratios mentioned above and the value of “accommodations, eating and drinking services” under the “Annual Report on Prefectural Accounts” (on the premise that the ratios are the same in Tokyo and in whole country). Be aware “eating and drinking” industry in Tokyo, estimated here, included both categories of “eating and drinking” and “food take-out and delivery service” in “2016 Updated Input-Output Table.”

Source: Annual Report on Prefectural Accounts (Cabinet Office), Updated Input-Output Table (METI).