

TRENDS

Manufacturing DX for the New Normal Era Digitalization of Manufacturing Accelerating after the COVID-19 Pandemic

Koichi Iwamoto

Research Associate, The Research Institute of Economy, Trade and Industry
Senior Fellow, The Japan Productivity Center

Urgent Issues for Manufacturing

The human race will be forced to live with COVID-19 (novel coronavirus) until a vaccine or treatment is developed, which currently might be one or more years away from widespread availability. Epidemics such as MERS and SARS have shown us that today's viruses mutate and gain strength rapidly, suggesting that even stronger viruses might appear in the future. So the world needs to prepare itself for the next virus.

Looking to recover from earnings that were hit hard by the effects of COVID-19, companies around the world are moving briskly to boost the pace of digitalization. The top US corporations are becoming even more influential, and their rapid move toward digitalization should be followed by Japan's manufacturers.

At a meeting of the Council on Economic and Fiscal Policy held on July 22, 2020, the Japanese government presented the essentials of the Basic Policy to guide the formulation of the annual budget for FY2021. Its focus is a Digital New Deal calling for concentrated investment on digitalization that strikes a balance between measures to combat COVID-19 and economic activities.

Human Placement Optimization

The manufacturing industry has always optimized the placement of plants and supply chains without optimizing the placement of the places where people work. Human workplaces are designed as mass groupings that bring everyone together in a single location to work from 9AM to 5PM. Is the work style used by Japanese companies dating back to the early Showa period (1920s) "optimum" for maximizing their performance? I think the answer is probably "No."

The educational system of that time was generally designed to produce conformity on a mass scale. The regimented, team-based approach of the Japanese workplace may have been effective for that objective. Sayings from the time such as "the nail that sticks out gets pounded down" and "harmony is the greatest of virtues" show that human relationships were valued more than work performance back then. However, today's Japanese companies do not have the luxury of pounding down the nails or valuing harmony over company earnings. Some workers may have a two-hour commute to work that leaves them exhausted on arrival. Some may have to care for infants or elderly

parents. Some may be more productive working on their laptop in a coffee shop. I think the number of young people who openly complain of wasting their lives on commuting is significantly higher today than it once was. Companies that expect workers to cope with rush-hour commutes are now almost wholly unjustified in that expectation.

Over the past 30 years of the Heisei Era, Japanese society has increasingly recognized and utilized the diverse personalities and talents of its people. The working style that produces the best performance varies from person to person, and cannot be the same for everyone. COVID-19 has recently brought telecommuting to the Japanese workforce, and many workers likely find it an easier and more efficient way to work. Companies have no reason to make these workers go back to their previous working styles, and have come to understand that optimizing the placement of people will increase their productivity and sales.

If I may be so bold as to say, manufacturers have the technology to use remote workers for every operation that doesn't absolutely require the handling of physical objects in the immediate vicinity. Repetitive work can also be automated with artificial intelligence (AI). No matter how much skill a task takes, it can always be programmed as long as it is repetitive in nature.

Japanese companies are crowd-followers when it comes to all types of innovation. Working remotely and the use of AI are currently making rapid strides. Japanese companies can easily implement these innovations as long as they are bundled together with efforts to reform company operations, identify wasteful operations, create pleasant workplaces, and improve productivity.

Meanwhile, I want to make it clear that I am not saying all operations should be done remotely. Some people may work more efficiently by commuting to the office, while others may be better suited to in-person discussions. Even for the same task, the optimum working style will vary from person to person. Some types of work should not be done remotely, and some types do not always need to be done remotely. Trying to do everything remotely can lower a company's performance. The ideal approach is to



Graduated from Kyoto University in 1981. Joined the Ministry of International Trade and Industry after completing a program in Electronic Science and Engineering at Kyoto University's Graduate School of Engineering in 1983. Started his current position in April 2020 after holding positions such as Consular Representative at the Consulate-General of Japan in Shanghai, Deputy Director-General of Tsukuba Center at the National Institute of Advanced Industrial Science and Technology, and Counselor at the Cabinet Secretariat. Held a guest lecturer position in the MBA program of Hitotsubashi University's Business School of International Corporate Strategy (ICS) from 2014 to 2017. A member of the Global Economy Research Group at the Japan Institute of International Affairs from 2018 to 2019. Specializes in social science research on digital businesses and digital economies that use digital technologies such as the IoT and AI. Started the Study Group on Development of Small and Medium-sized Enterprises (SMEs) Competitiveness Using IoT in April 2016 to research ways of helping SMEs adopt IoT-based technologies. Major publications include "Industrie 4.0" (Nikkan Kogyo Shimbun, Ltd.) and the co-authored work "Artificial Intelligence for Business People" (Toyo Keizai Inc.)

create environments that each individual will find pleasant to work in.

Consider the operations done by manufacturers. Clerical operations are non-mission critical work that can be replaced by telecommuting and AI. And as long as it does not require physical objects in the immediate vicinity, even mission-critical work is all just office work replaceable by telecommuting and AI. The work done by departments such as product planning and development and design are examples of mission-critical office work. Another example

would be services made possible by big data obtained from products after sale as the user is using them. This area could possibly become a major source of income for manufacturers in the future. Production lines could also be adapted to telecommuting by installing robots and AI to enable remote control. The diagram in the insert on this page

shows the business model currently in use by the manufacturing industry (left), and the model that could be used in the future (right). In the future, users will use products provided by manufacturers, and the big data acquired through this product use will be provided to Internet of things (IoT) platform providers. Service providers will analyze the data

Current and Future Business Models for the Manufacturing Industry

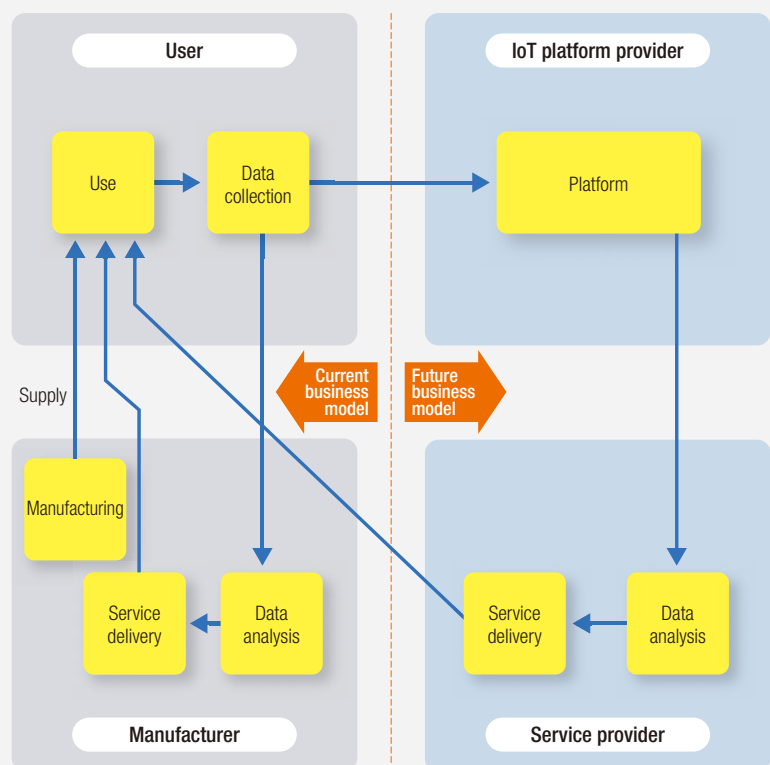
The manufacturing industry's approach to after-sales maintenance has always been just to repair machinery that breaks down after sale by sending out technicians to replace parts. Meanwhile, there is actually a big market for after-sales maintenance.

For example, Hitachi Lumada has a predictive diagnosis service. This service could be considered a type of after-sales maintenance service since it can be deployed on existing production lines or mechanical equipment as a way to increase the operation rate or create nonstop machinery. Solutions of this type attract a high level of interest, indicating high general demand for nonstop machinery and ways of boosting production line and machinery operation rates.

Rolling stock delivered by Hitachi in the UK is another example that indicates high demand for nonstop and breakdown-free rail transport. For manufacturers, the after-sales maintenance market could potentially become a source of income second only to their earnings from product sales.

After machinery delivery, operation data is acquired in real time and analyzed by AI to provide the customer with new after-sales maintenance services. Increasingly

sophisticated and versatile services are expected to be created as ever more diverse types of data are collected in ever larger volumes. Companies providing these types of services have already appeared in countries such as the USA and Germany.



to develop new services they provide to users. These business activities will be replaceable by remote work and AI.

In May 2020, I took part in an online conference of Japanese and German experts entitled “Germany-Japan Expert Meeting: Web Conference on Manufacturing Policy in the World of Post-COVID-19.” The discussion reflected COVID-19’s immense impact on the manufacturing industry, and considered how the industry should handle the coronavirus, post-coronavirus, and “new normal” eras. The participants were from Japan and Germany—both countries with industries centered on manufacturing. There were experts in the manufacturing sector along with representatives of the key organizations promoting digital transformation (DX) in the manufacturing industry⁽¹⁾. My experience with these sorts of online events (study groups, seminars, meetings, etc.) has brought me only benefits. I have found no demerits. I want these events to be a part of my life from now on. The benefits are: (1) taking part from the comfort of my room while being free to use the restroom or drink coffee; (2) not having to leave my room in the summer heat or pelting rain, making it easy to drop in for just part of a meeting. Having to leave my room for a meeting means not being able to do anything else from the time I leave until the time I get back; (3) being able to do other work on my PC while taking part in a meeting at the same time; and (4) easily being able to take part in international conferences without having to leave Japan.

The innovations described here will require us to carefully examine the division of labor between humans and machines. This division of labor is a feature of the operations done by manufacturers. However, since the spread of COVID-19, the roles of humans, the roles of machines, and the division of labor between the two may have to be re-evaluated. In light of COVID-19’s impact in the coming years, humans and machines will need a solid relationship designed for the needs of the future. What might that relationship look like? The field that studies the relationship between humans and machines is called Human-Machine Interaction (HMI).

Why Japan has Lagged behind the World in Digitalization

A look at the 2018 world ranking of companies by market cap shows the top spots dominated by major US IT corporations such as Apple Inc. and Amazon.com, Inc. US company managers have been making sweeping investments in the digital sector, well aware that the information and communication technology (ICT) sector has been a top global earner for the past 20 years or so. This conviction appears to have been validated by the high returns these investments have yielded. Meanwhile, the leading Japanese banks and manufacturers that were among the world’s top-ranked companies by market cap at the peak of Japan’s bubble years have now all vanished from the top spots.

Japanese company managers have largely shied away from investing in the ICT sector over the past 20 years. It is unclear whether their managers were unaware of the money-making opportunity the sector has represented over that time, or whether they were aware but decided not to invest. What is clear is that the result has been low market valuations for Japanese companies.

The aggressive past investments of US companies in the digital sector have now started to yield high returns. The US ICT sector’s markup factor⁸ of 2.14 is quite a bit higher than in other sectors, indicating that it drives the US economy. In contrast, Japan’s ICT sector has a markup factor of just 0.84. The country also has no industry that generates earnings large enough to drive its economy. So Japanese companies rank below their Western counterparts in an overall comparison by markup factor, and the gap has been large since 2010.

Japanese companies also invest little in the digital sector. Most IT investment is defensive in nature, designed to cut costs and reduce staff sizes. Half of all the investment is designed to improve business process efficiency. There is little aggressive investment targeting business model development or sales growth.

Only minuscule earnings are generated by cutting costs and reducing personnel. The low return on investment (ROI) of IT investment leads corporate managers to feel the IT investment is unprofitable. The result is a vicious cycle of managers becoming more and more disillusioned with IT investment. Pursuing cost cuts and reducing personnel not only does little to increase earnings while leaving sales to stagnate, but it also lowers employee morale, making workers wonder whether they are next in line for dismissal. On the other hand, working on releasing new products and services boosts sales and greatly increases earnings. And, more importantly, it stimulates employees. Employees' spirits are lifted as they see benefits arising such as less overtime, maternity leave, opportunities for using paid leave, and hikes in salaries and bonuses.

* The sales price of a product divided by its cost (marginal cost). Indicates how many times the manufacturing cost a product is sold for. A value of 1 means the sale price is exactly equal to the manufacturing cost.

Digitalization Trends of the Fourth Industrial Revolution

There have so far been two major trends in digitalization:

- (1) Digital innovations have been replacing the routine operations done manually by site workers (routine manual operations) with work done by robots. Moving forward, routine clerical operations done by office workers (routine cognitive operations) will be replaced by AI.
- (2) Devices and specifications such as sensors, semiconductors, memory, and bandwidth are rapidly becoming faster, smaller, and higher-capacity. These innovations will make it increasingly possible to identify the needs of individual consumers, resulting in more customization to provide products and services tailored to these needs.

There will also be a third major trend in the future. Companies will start to adopt remote working styles at a growing pace, which should result in rapid growth of markets designed to meet the needs of businesses with remote workers.

Once the novel coronavirus pandemic has ended, the

trends above will likely take off suddenly as company earnings recover. Radical changes in the behaviors of individuals and companies can devastate some markets while creating new markets. These new markets could be massive ones where the winners and losers are decided by digital technology.

Reference

- 1) Robot Revolution & Industrial IoT Initiative, "German-Japanese Experts Meeting: Manufacturing Policy in the world of Post-COVID-19," https://www.jmfri.gr.jp/content/files/Open/2020/20200701_AG1_Post%20COVID19/Post%20COVID-19-E_r9.pdf