White Paper on Monodzukuri 2023

- The White Paper on Monodzukuri (Manufacturing Industries) is a statutory report based on the Basic Act on the Promotion of Core Manufacturing Technology. This is the 23rd annual report.
- It consists of Part 1 covering basic data on manufacturing industries, challenges of the year, and government initiatives and Part 2 spelling out manufacturing industry promotion measures.

Contents

Messages from White Paper on Monodzukuri 2023

Changes regarding Manufacturing Industries

Changes in the environments surrounding the manufacturing industry

1. Growing supply chain disruption risks accompanying destabilization of the international situation through Russia's invasion of Ukraine, etc.
2. Growing global momentum toward achieving decarbonization
3. Labor shortage of about 110,000 workers, increased importance of reducing production costs and raising product prices appropriately amid soaring raw material and energy prices

Important initiatives

1. Enhance supply chain resilience and ensure production capacity stably by changing production plans and reallocating resources quickly
2. Grasp carbon footprint across supply chains
3. Improve productivity and energy efficiency through labor-saving and automation measures

➡ **As measures at individual companies are difficult and inefficient, it is important to take advantage of digital technology for visualizing and coordinating initiatives of all business operators involved in supply chains.**

Changes in business environment for manufacturing industries

1. Development of a service business model that standardizes and digitizes all processes related to manufacturing and sells them to manufacturers
2. Emergence of manufacturers who use the service business to improve productivity and energy efficiency

Important initiatives

1. Improvement of services based on data to extend customer relationships and diversify profit earning measures
2. Optimization of processes from market research and planning to manufacturing, logistics, and sales to enhance competitiveness

➡ **Business operators involved in supply chains and consumers can now share data with each other, thereby improving profits of service providers, manufacturers, and consumers.**

Japanese and overseas trends

Japan

- Japan has strengths in partial optimization and high productivity of workplaces due to the presence of advanced on-site operations and skilled technicians.
- On the other hand, only about 20% of manufacturers have successfully linked and visualized data among companies.

Overseas

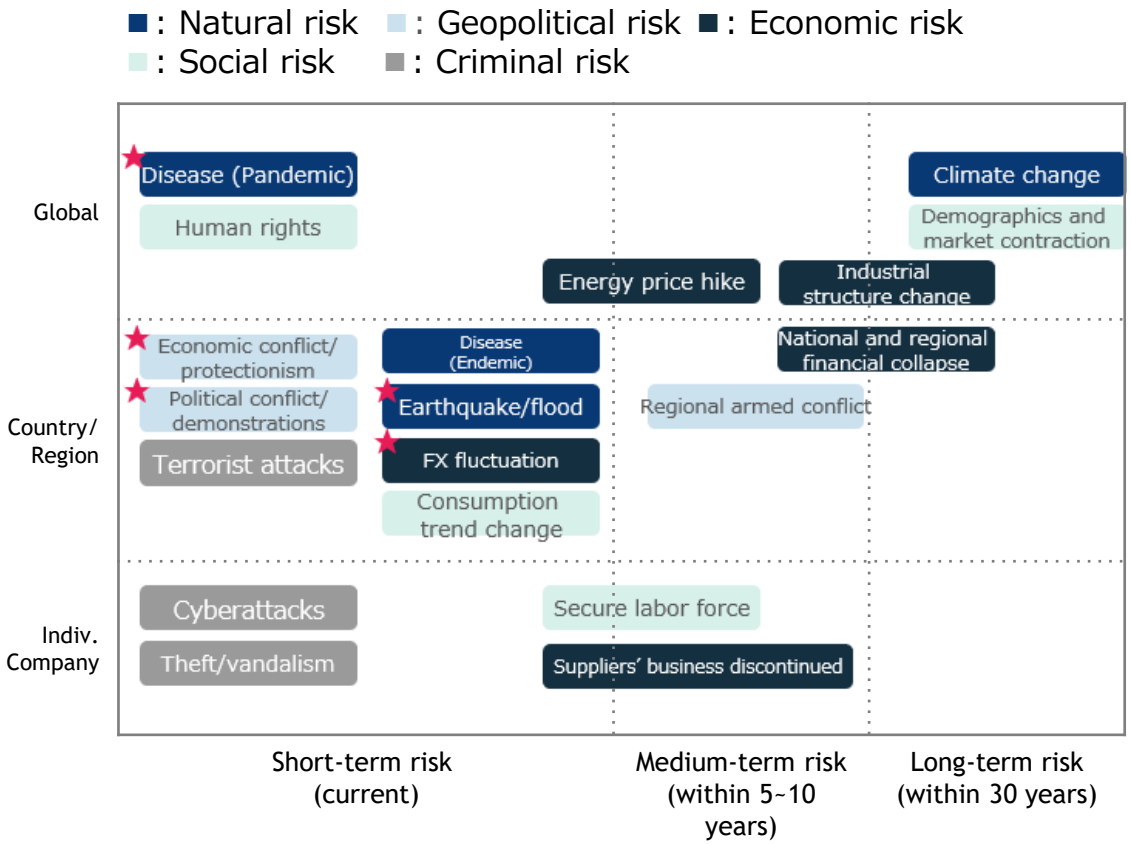
- Advanced overseas companies have strengths in data linking and the digitalization and standardization of production technologies and have realized optimization beyond company boundaries.
- In Europe, a data linking platform for manufacturers has been launched to optimize supply chains.

- **It is necessary to optimize supply chains and enhance competitiveness while leveraging workplace strengths.**
- **It is important to create a virtuous cycle where the expansion of digital transformation investment and the promotion of innovation, which are indispensable for green transformation, will improve productivity and increase profits to raise income.**

Changes in the environments surrounding the manufacturing industry

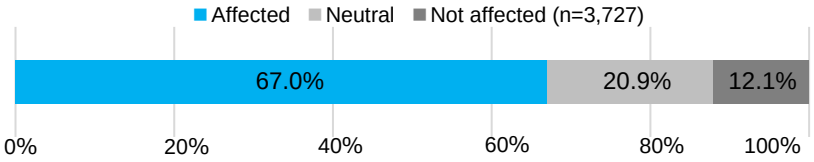
- As events that were difficult to predict in advance, such as the spread of COVID-19 and Russia's invasion of Ukraine, have occurred one after another, Japanese manufacturing industries face **the challenge of strengthening supply chains** through the identification of suppliers and the relocation and expansion of production bases.
- It is **necessary to make efforts throughout the entire supply chains** beyond company boundaries in order to **realize decarbonization and the protection of human rights,** which are gaining momentum worldwide.
- In order to realize these goals, **all business operators should use digital technologies to visualize and link their initiatives.**

Figure 1: Risk factors affecting manufacturing industries



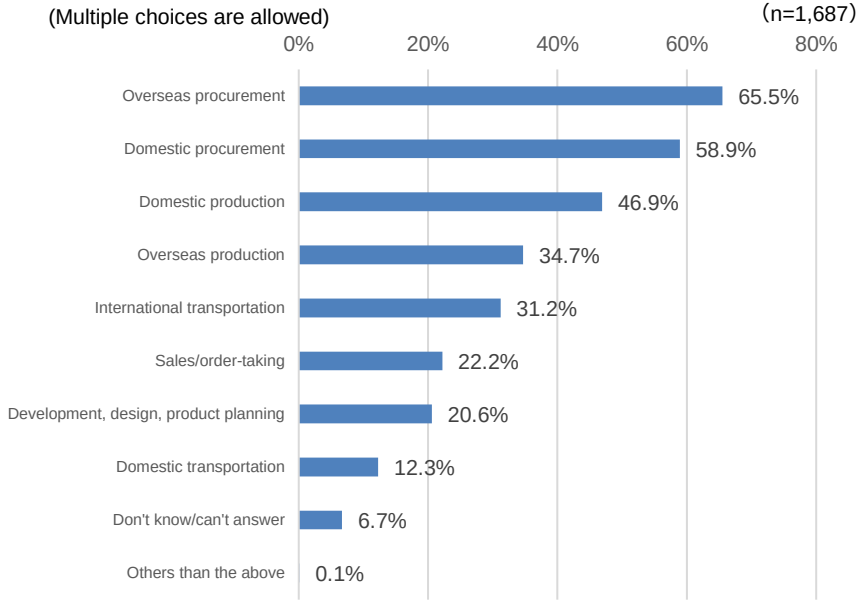
Source: Ministry of Economy, Trade and Industry "First Session of the Study Group on Advancing Global Supply Chains in the Digital Age" (June 2022)

Figure 2: Impacts of geopolitical risks on supply chains



Source: Created by the Ministry of Economy, Trade and Industry from a press release of CADDi Inc. (September 2022)

Figure 3: Activities affected in supply chains



Source: Created by the Ministry of Economy, Trade and Industry from a press release of CADDi Inc. (September 2022)

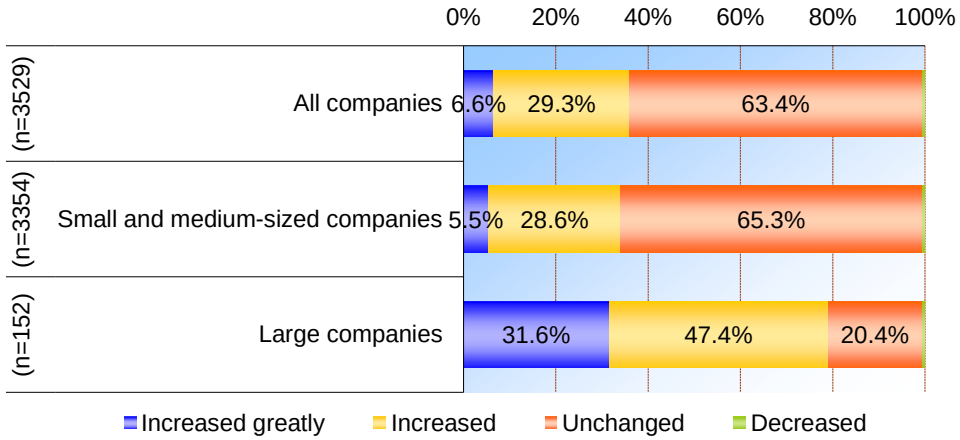
Growing importance of green transformation for manufacturers

- Including draft European battery regulations, **market rules regarding decarbonization are being developed around the world**. As **Japanese companies are required to respond to these rules**, the importance of decarbonization initiatives is growing.
- As manufacturers are **increasingly being urged to promote decarbonization**, they are advancing initiatives to enhance and strengthen supply chains.

Figure 1: Outline of draft European battery regulations

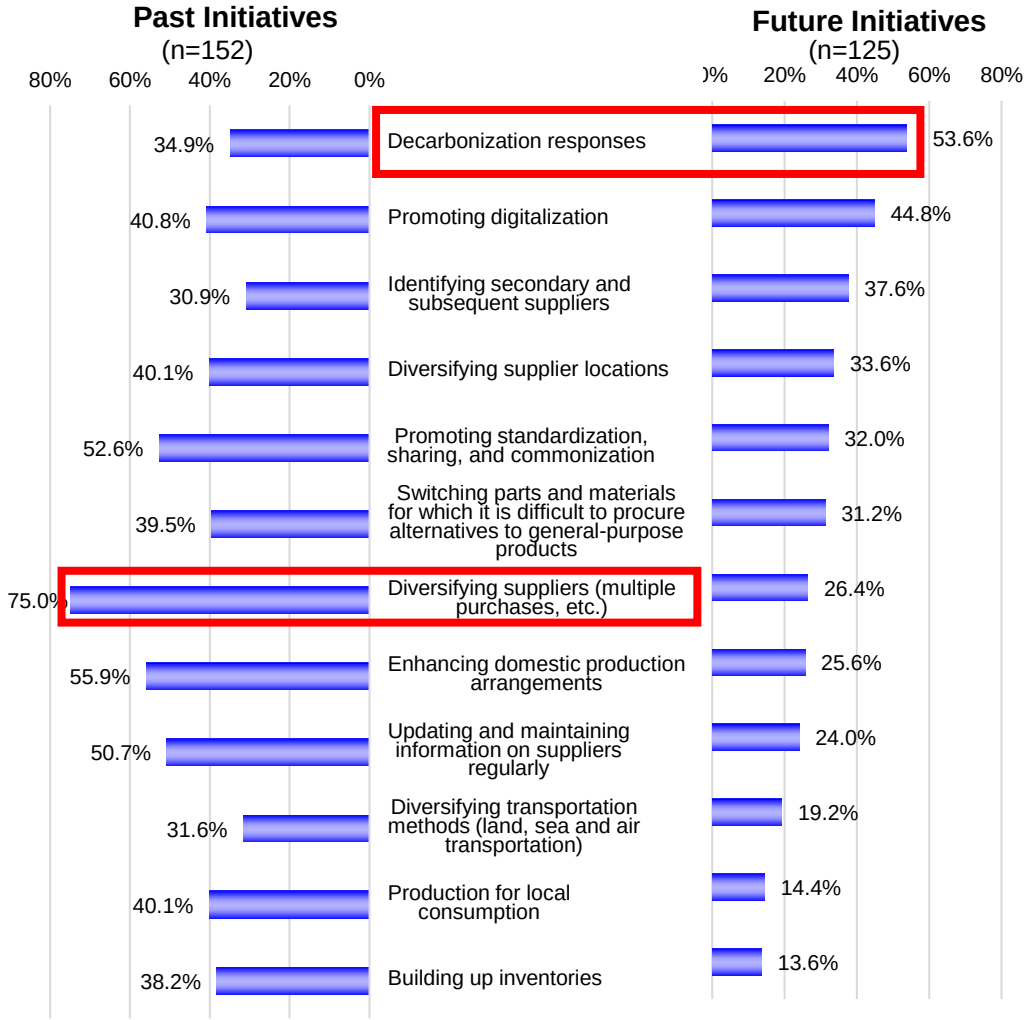
Scheduled enforcement date	In or after 2024
Objectives	Regulate the entire lifecycle of batteries traded on the European Union market, from manufacturing to reuse and recycling, and ensure their safety, sustainability, and competitiveness.
Main regulations (partial)	• Declaring carbon footprint, including manufacturer and manufacturing plant information, total CO_2 emissions from batteries and each stage of their lifecycle, and certificates from independent third-party verification organizations (July 1, 2024~) • Labelling performance classes to facilitate the identification of CO_2 emission intensity throughout the lifecycle (from January 1, 2026) • Introducing an upper limit on carbon footprint throughout the lifecycle (from July 1, 2027)

Figure 2: Changes in importance of decarbonization (year-on-year)



Source: Mitsubishi UFJ Research & Consulting Co., "Survey on Issues and Directions of Responses for Japanese Manufacturing Industries" (March 2023)

Figure 3: Companies' initiatives to stabilize and enhance supply chains (Large companies)



Source: Mitsubishi UFJ Research & Consulting Co., "Survey on Issues and Directions of Responses for Japanese Manufacturing Industries" (March 2023)

Changes in business environment for manufacturing industries

Progress in horizontal division of labor through digitalization and standardization

Manufacturers have traditionally **secured** design, development, manufacturing, sales, and other functions **in a vertically integrated manner on their own**. **Japanese manufacturers have been good at aligning such functions**.

→ The promotion of standardization and digitalization has allowed not only product design but also production line design and on-site operations into **explicit knowledge**, leading to **progress in the horizontal division of labor**, including the emergence of **businesses that provide these production functions to others**. Barriers to entry into manufacturing have been lowered, **accelerating such entry**.

Visualization and dynamicization of supply chains

Business relationships are fixed between existing companies, demonstrating **high productivity in normal times**.

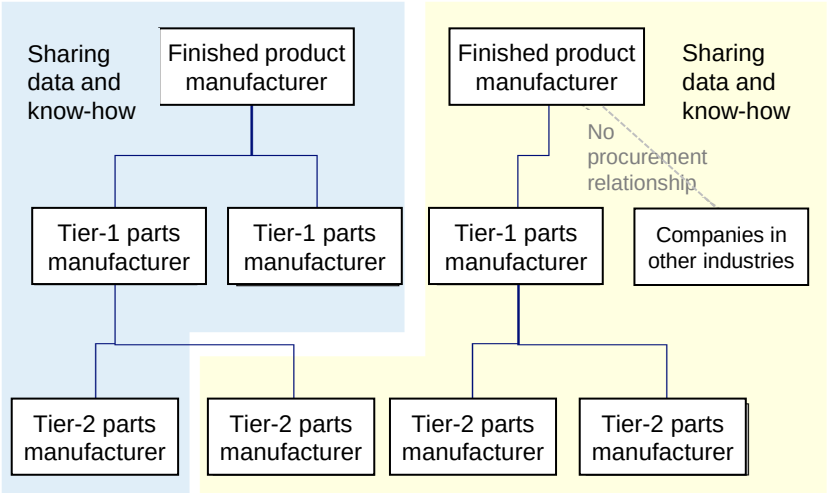
→ In order to respond quickly to customer needs or to dynamically change suppliers in the event of an emergency such as a disaster, however, manufacturers are required to **optimize business operations through data sharing across individual companies and groups**.

→ From the perspective of sustainable development goals (SDGs), manufacturers are required to become aware of **information on CO2 emissions and human rights protection** throughout supply chains.

Specific example: VinFast (automotive industry)

- Vin, Vietnam's largest corporate group, launched VinFast as the country's first automobile manufacturer in 2017.
- Although the company had had no core technology related to automobile manufacturing, it managed to actually produce automobiles in about half the time required earlier, and entered the U.S. electric vehicle market in late 2022.
- The factors behind the rapid development include **the introduction of factory lines and production technologies for major automobile manufacturers that have been standardized and digitized** by a service provider (Siemens), and the thorough implementation of quality control through invited top engineers.

Potential future supply chains for manufacturers



Status and challenges of digital transformation in Japan

- In the World Digital Competitiveness Ranking 2022* covering 63 economies, Japan ranked 29th, the lowest ever. It ranked **lowest in "use of big data and analytics" and "agility of companies."****
- While Japanese manufacturers recognize the necessity of data linking between companies regarding **the visualization of production processes, distribution status, and CO2 emissions, the percentage share for those that have implemented the visualization is small.**

Figure 1: Visualization of manufacturing processes and distribution status between companies regarding supply chains

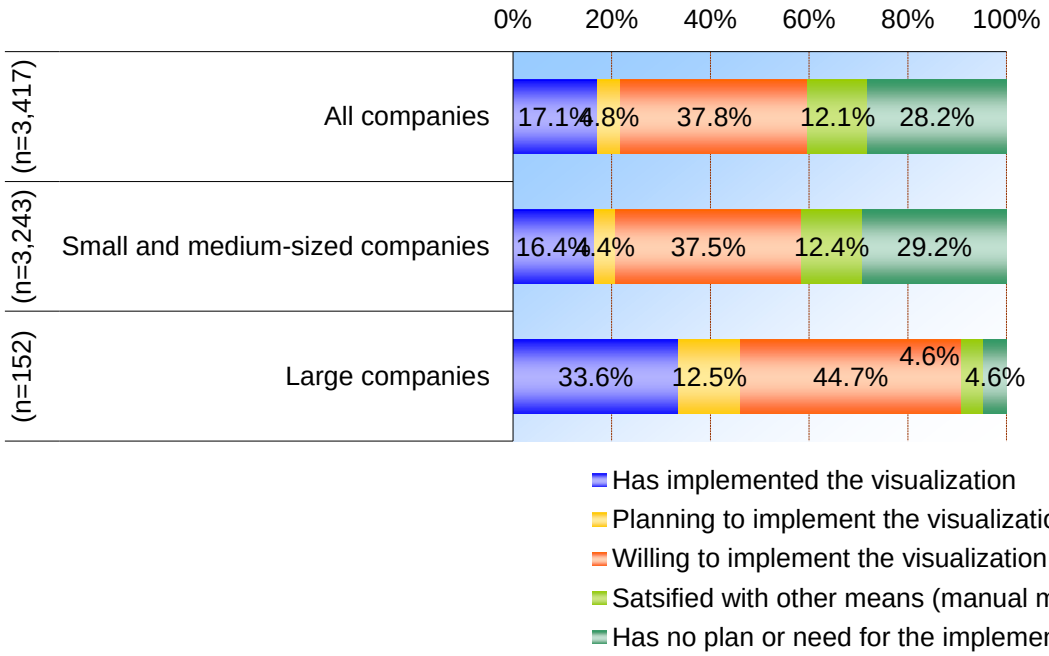
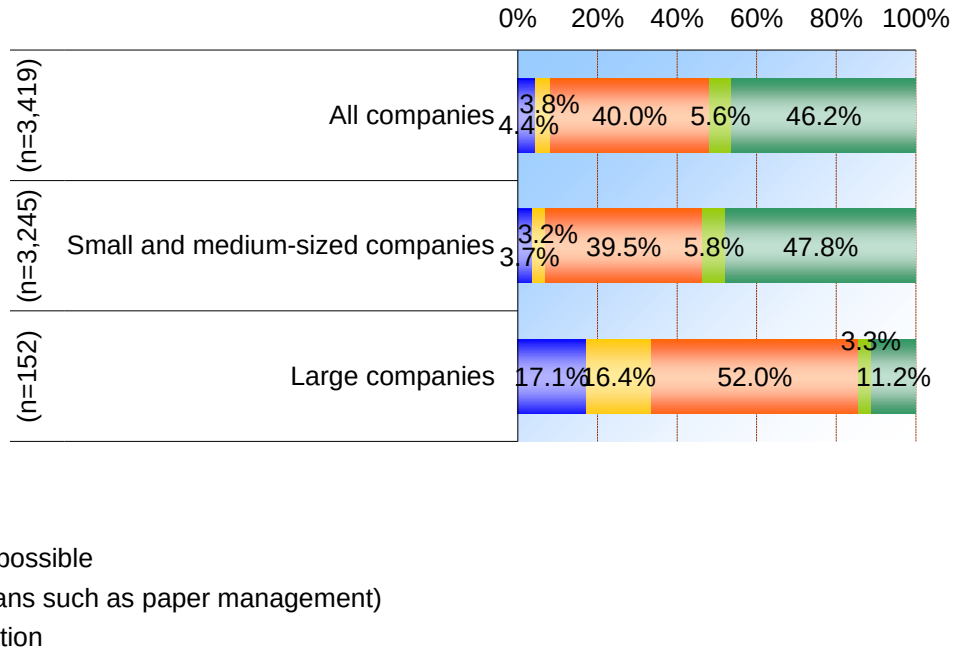


Figure 2: Visualization of CO2 emissions between companies supply chains



Source: Mitsubishi UFJ Research & Consulting Co., "Survey on Issues and Directions of Responses for Japanese Manufacturing Industries" (March 2023)

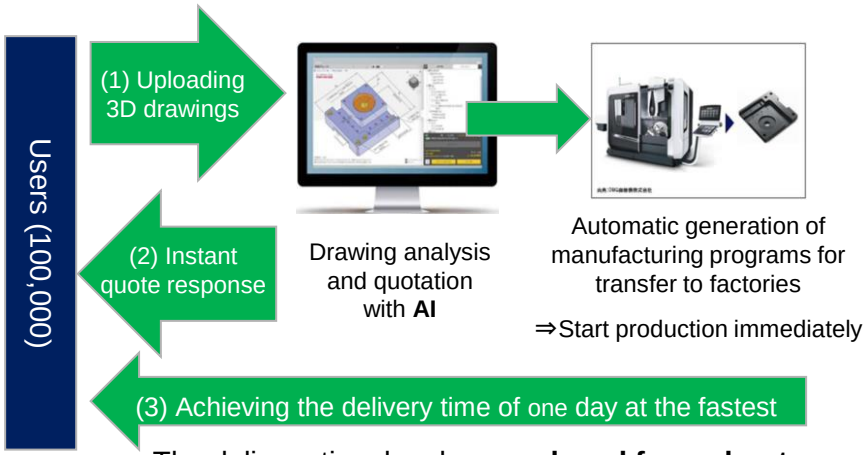
*Compiled by the International Institute for Management Development
**Japan ranked lowest in "international experience" and "response to opportunities and threats" as well.

Progress in horizontal division of labor through digitalization and standardization in Japan

Case Development of an online parts procurement service "meviy"

[MISUMI Group Inc.]

- The Company had **yet to be able to move away from analog methods**, such as creating paper drawings, sending, and receiving them by fax to procure, and sourcing parts for production equipment.
- MISUMI, a machine parts manufacturing and trading company, has **developed the procurement service platform "meviy"** that combines AI-based instant 3D drawing reading, quotation, and delivery calculation functions, and the ability to automatically generate cutting programs from drawings for transfer to machine tools.
- The platform has reduced the **delivery time from approximately one month to a day at the fastest.**
- As of February 2023, **100,000 registered users exchanged 11 million drawings, contributing to the digital transformation of the entire manufacturing industry** accumulated data; the company expects to accelerate global expansion.



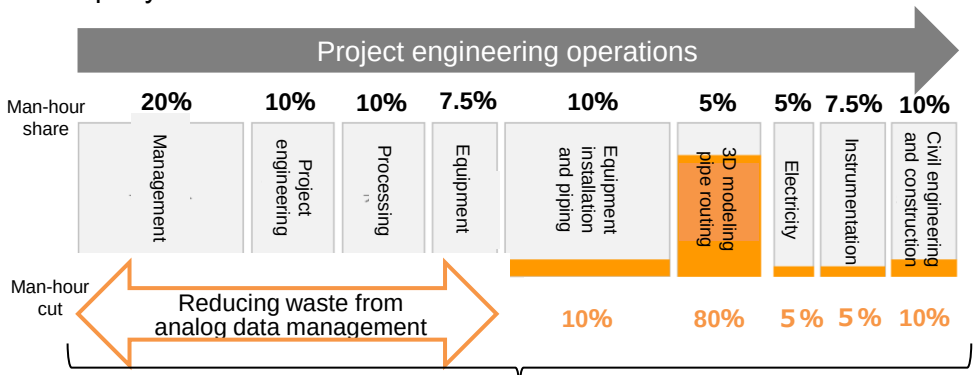
The delivery time has been **reduced from about a month to as little as a day at the most.**

Source: MISUMI Group Inc.

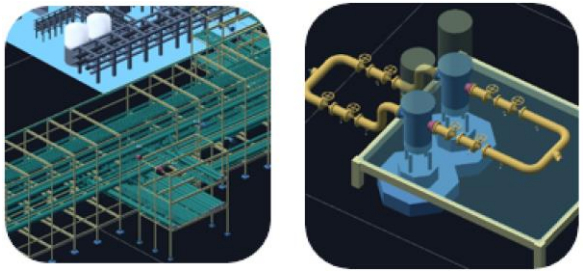
Case Global expansion through commercialization and formalization of expert knowledge

[Arent Inc.]

- In plant design in the construction industry, CAD design work largely **relied on manual labor by skilled personnel**.
- In collaboration with a major construction company, Arent has successfully turned skilled plant design know-how into an algorithm. In the past, it took four hours to design a single pipe, but **now it is possible to design 1,000 pipes in one minute**.
- In April 2021, the company started to externally market the application that transformed the know-how of skilled engineers into explicit knowledge. The application is used in the engineering industry in Japan and is rapidly expanding globally as well. Within the next five years, the company aims to increase its overseas customers' share to 70%.



10% overall man-hour reduction
+ reduction of analog work waste and rework



Automatic piping can be performed in virtual space

Source: Arent Inc.