

# Steel Business

(JFE Steel Corporation)



The “sophistication of data use” is the essence of JFE Steel’s digital transformation (DX).

The IT Innovation Leading Department and the Business Process Innovation Team are integrating IT platforms, including systems upgrades at steelworks. By linking expertise and data accumulated to date (the Integrated DB) with images and sensor data obtained with the latest technologies, we are building a platform that can fully use this data to further increase customer value.

At the same time, we are addressing increasingly sophisticated cyberattacks by implementing swift and comprehensive risk countermeasures for the entire Group, led by the JFE-Security Integration and Response Team (JFE-SIRT). We are also raising the level of our security management with the intention of migrating to “zero trust” architecture as a new security model.

Our DX aims to strategically use the huge wealth of data on a secure IT platform to achieve a preeminent strategic position.

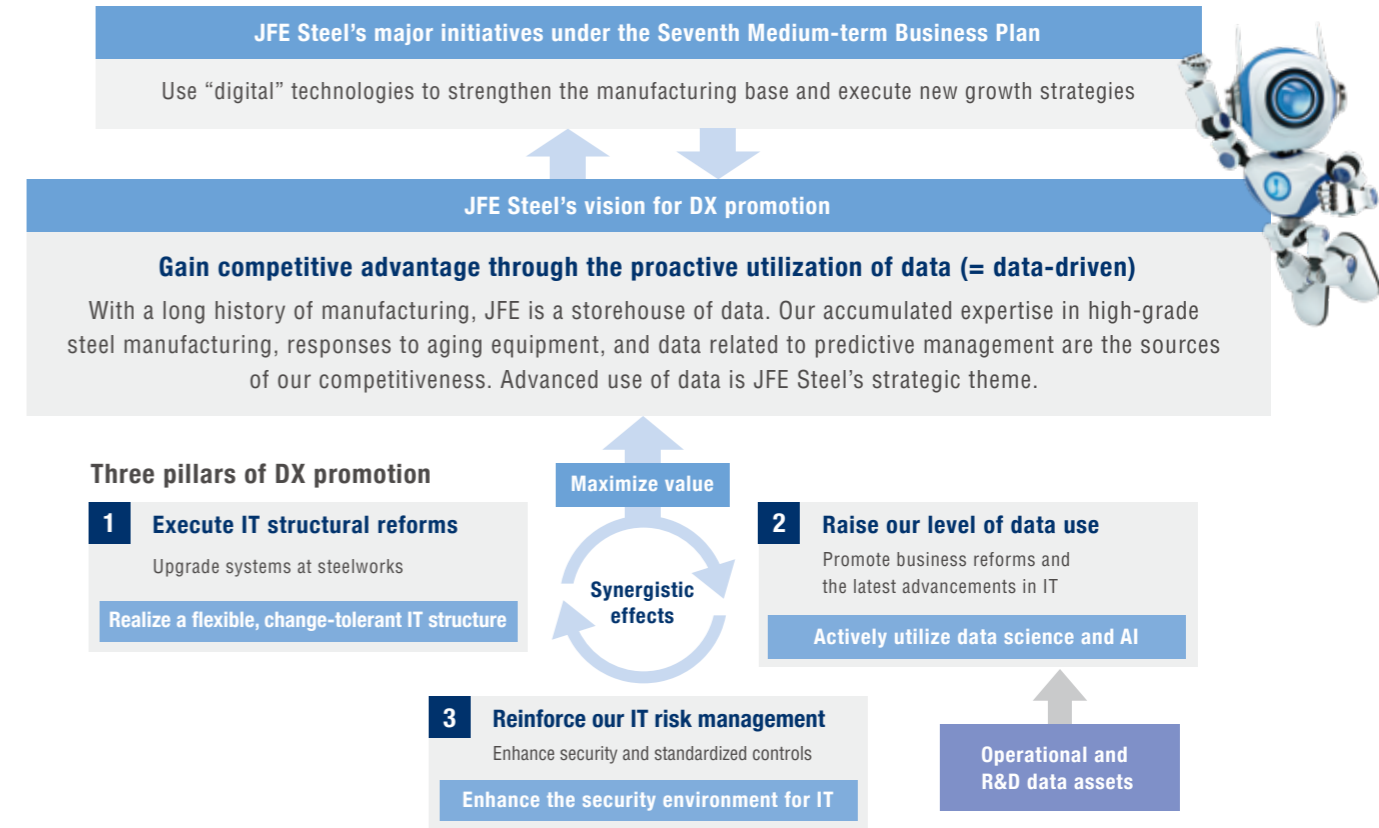
The core of “advanced use of data” in manufacturing is the realization of CPS for blast furnaces at all steelworks. Our development of all processes going forward will simultaneously achieve sophisticated automation, stabilization, and high efficiency of operations with high product quality. Ultimately, we aim to integrate all CPSs on an information technology (IT) platform to create a CPS for an entire steelworks, to realize “intelligent steelworks” capable of executing optimal automated operations. We will also pursue cutting-edge technological development with a view to marketing these technologies externally.

In addition, we will use cutting-edge technologies for the large-scale passing on of skills, conversion of knowledge and expertise to artificial intelligence, and robotics to raise by several levels people’s working capability, increase labor productivity, and transform workplaces into more comfortable environments.

Regarding the cultivation of the DX human resources (internal data scientists) who will be the key individuals in the use of data assets and information and communication technology (ICT), we will create more extensive data science tools and will also reinforce our frameworks and activation measures for human resource cultivation as we work to strengthen the driving force behind our DX propulsion.

## Vision for DX promotion

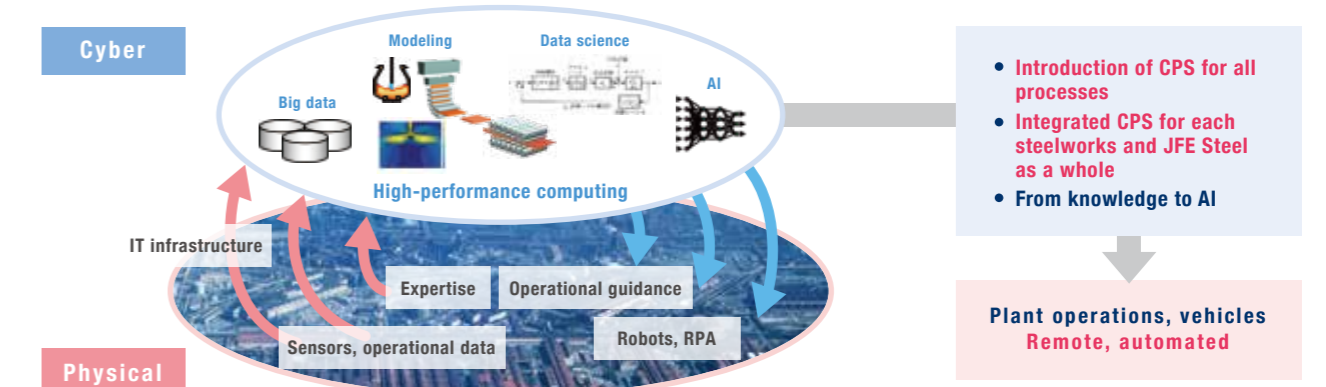
The main pillars of JFE Steel’s DX are the introduction of technologies like the Internet of things (IoT), artificial intelligence (AI), and data science (DS) for gaining a competitive advantage by proactively utilizing data (= data-driven). We have a longer history of manufacturing than companies in other countries, and our various types of data are invaluable. Our accumulated expertise in high-grade steel manufacturing, responses to aging equipment, and data related to predictive management are the sources of our competitiveness, as we make the advanced use of data one of JFE Steel’s important strategies.



## Toward intelligent steelworks

We aim to realize “intelligent steelworks” by integrating all CPSs on a data platform to create a CPS for an entire steelworks that carries out optimal automated operations. We are also developing remote and automated plant operations and vehicle operations.

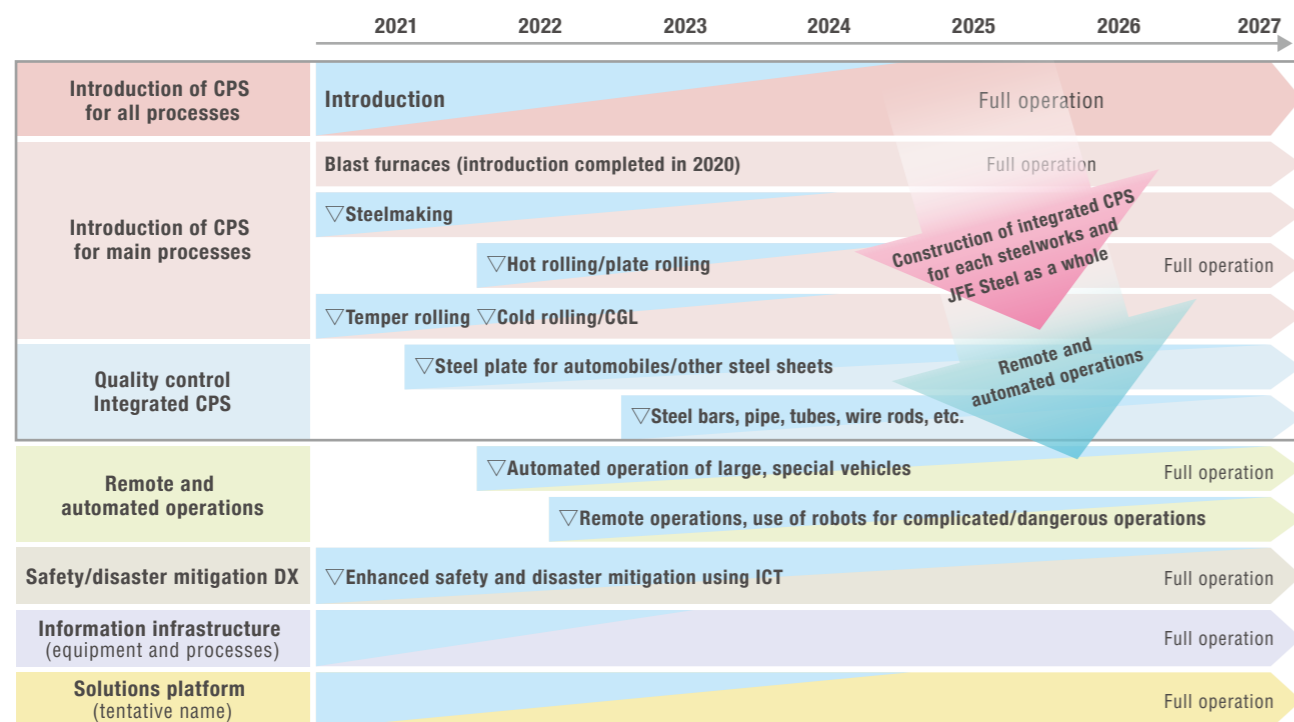
**Intelligent steelworks that learns on its own to autonomously carry out optimal automated operations**



Objectives and results of CPS implementation	Products and services	• Higher yields	• Enhanced quality assurance and quality	• Expedited development
	Processes	• Enhanced efficiency and productivity	• Cost reductions	• Prevention of problems
	Manufacturing sites	• Enhanced labor productivity	• Passing on of skills, human resource training	• Greater safety and security

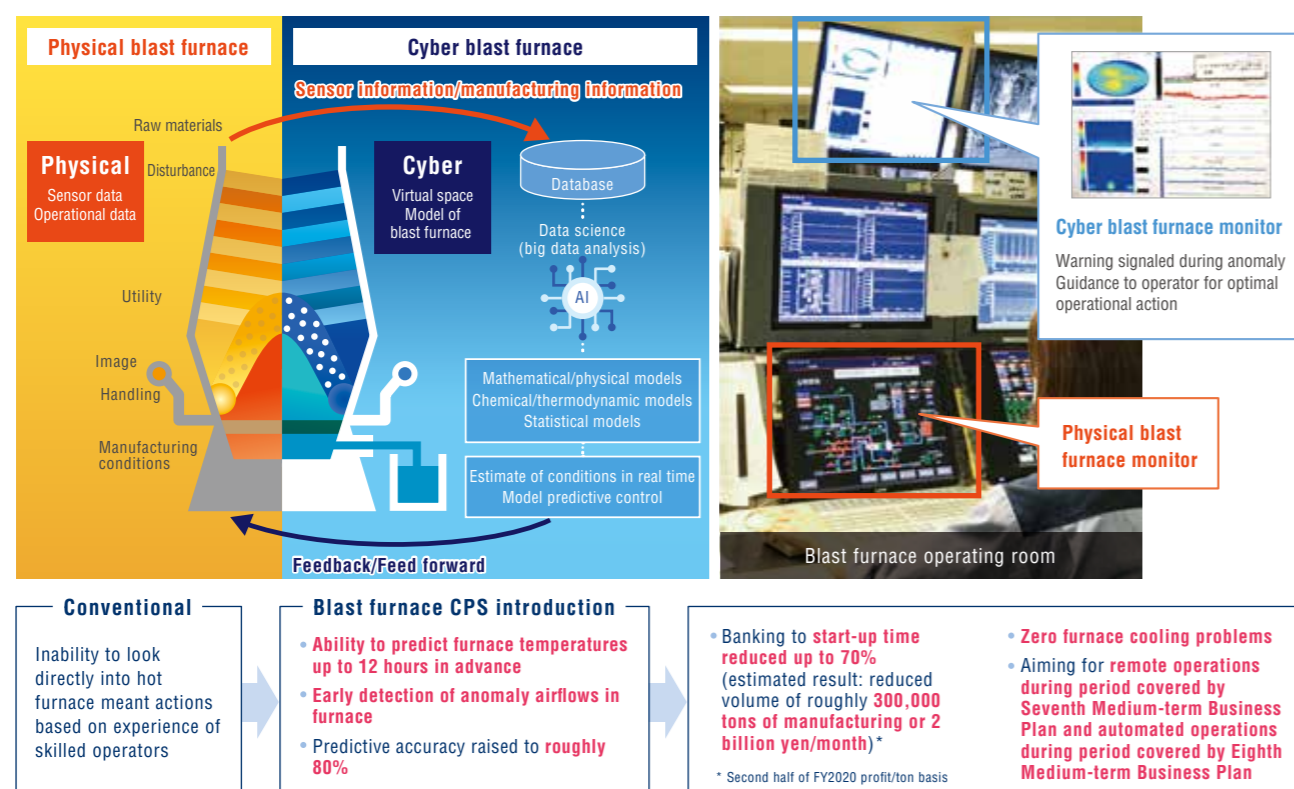
## DX promotion road map

To achieve “intelligent steelworks,” we will complete the introduction of CPS for all steelmaking processes during the period covered by the Seventh Medium-term Business Plan, while also constructing an integrated CPS for each steelworks and JFE Steel as a whole. We will also pursue remote and automated operations, aiming to achieve even higher productivity and manufacturing stability.



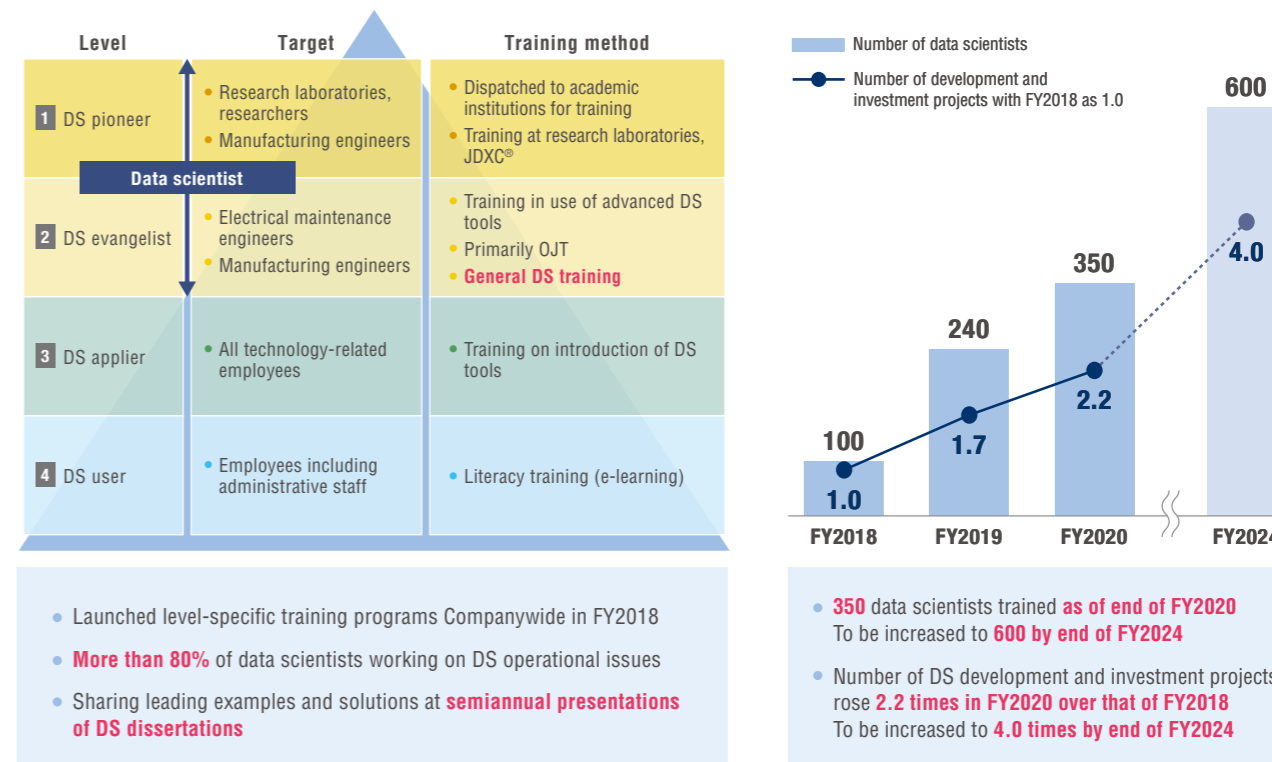
## CPS example: Blast furnace CPS

We are introducing CPS at all blast furnaces and have developed and introduced technologies that can detect signs of anomalies that could lead to major problems inside a blast furnace, which previously were difficult to detect, and predict temperatures in a heated blast furnace up to 12 hours in advance, which is important for stable operations. We have also built a system that takes the results of those predictions to give guidance to operators for optimal action to take at that time, and are beginning to use those actions for stable operations and stable production.



## DX human resource development: Training data scientists

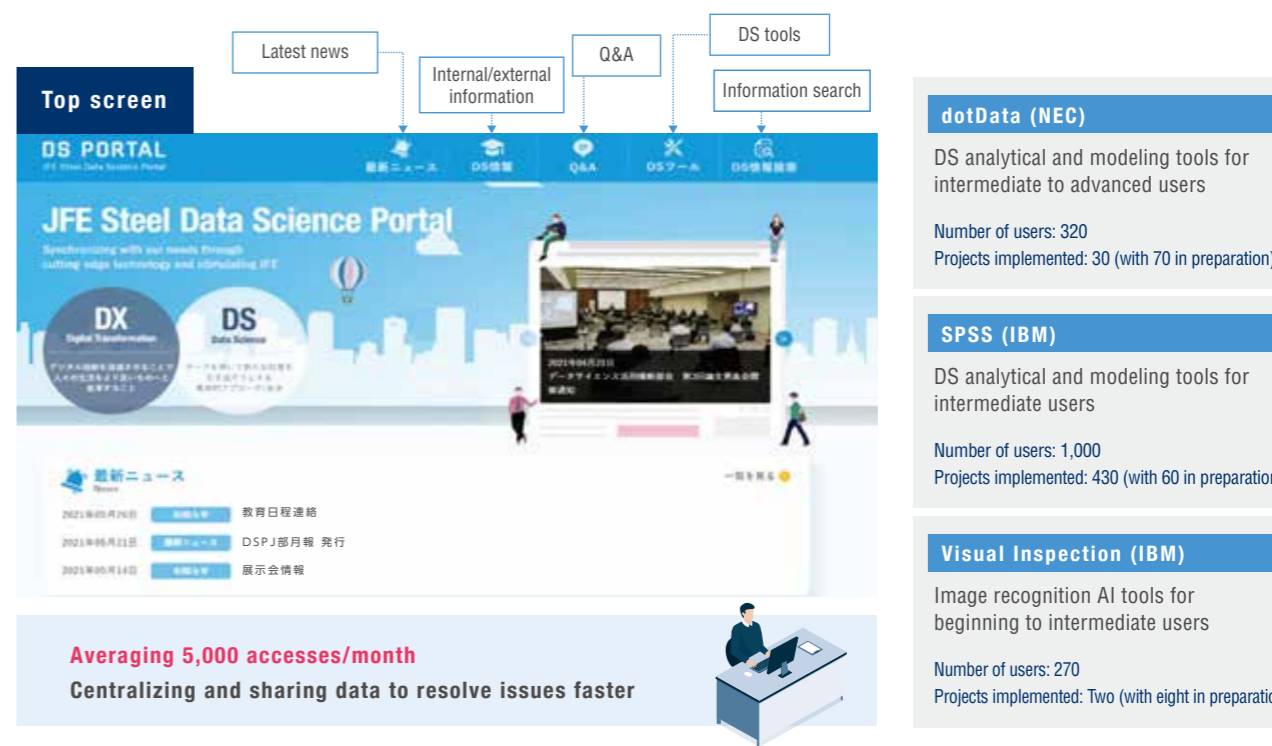
For DX promotion, we are building easier-to-use environments and frameworks for utilizing data science to cultivate data scientists internally and encourage their activities, allowing many employees to take part in our DX promotion.



## Activating DS utilization: Launching DS portal and creating DS tools and apps

The JFE Steel Data Science Portal, a site that can be viewed by all employees that consolidates information about DS and robotics and the introduction and utilization of applications, was launched in March 2021 and is activating DS utilization.

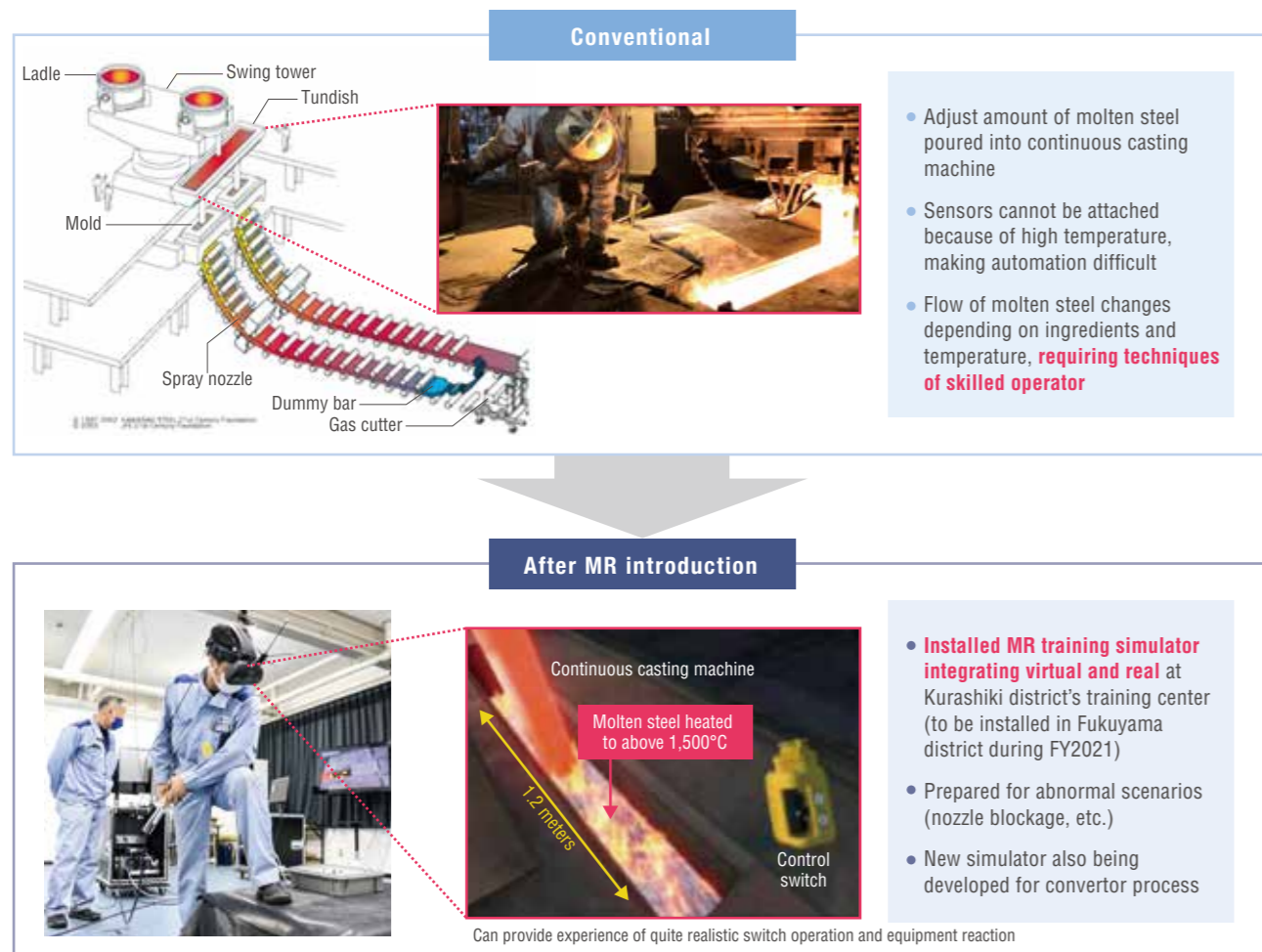
All employees can upgrade and enhance the latest DS tools on their own personal computers at any time, and OJT is carried out by speakers from vendors and manufacturers who give presentations on workplace issues. Cases of implementation are steadily increasing, and sharing information via the DS portal is further activating DS application.





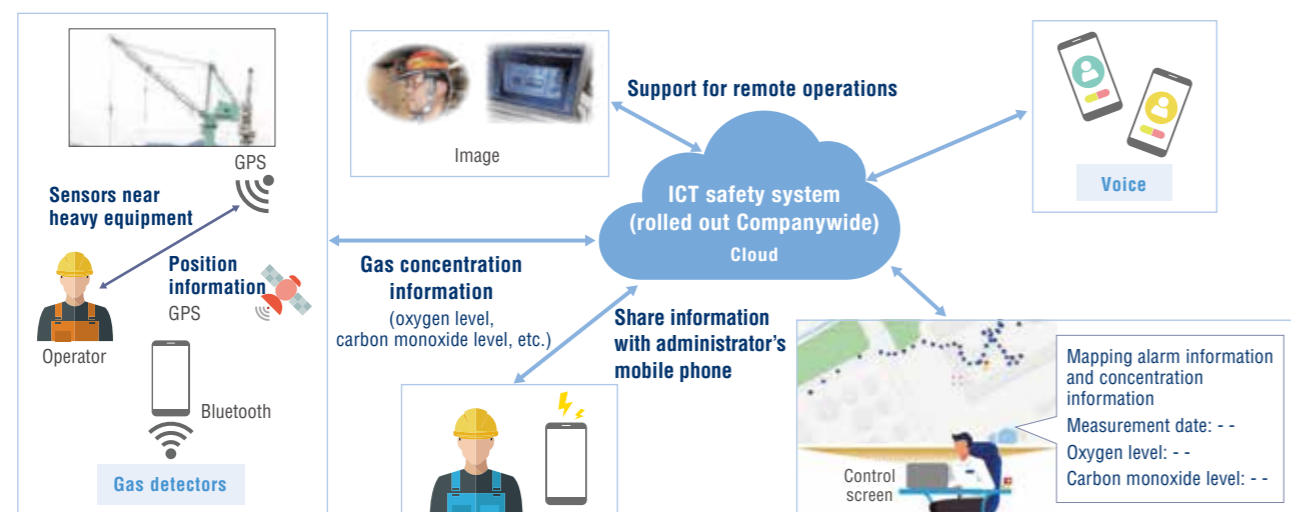
## Using ICT to train human resources and pass on skills: Mixed reality (MR)

Operations that can be automated: Promoting introduction of robots to further increase labor productivity  
 Operations that require human skills: Using latest technologies while safely and steadily passing on skills



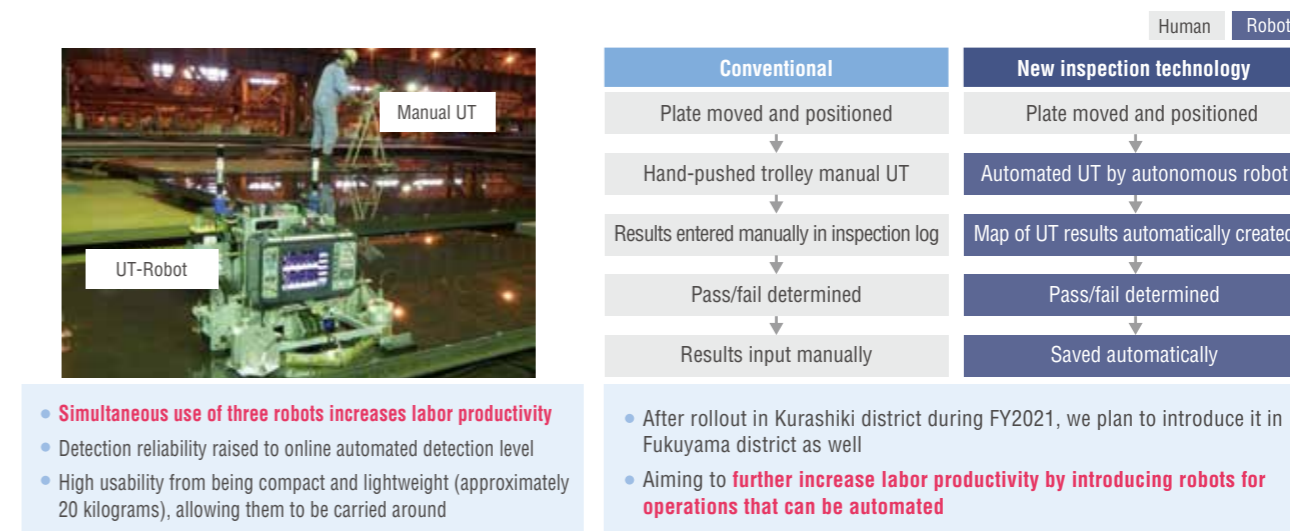
## Using ICT for increased safety: Workplace safety monitoring and operational support

We pursue multifaceted safety management (monitoring, detection, etc.) that includes DX. We are developing various workplace operations and strengthening their functions through initiatives including using the latest information technology to increase workplace safety, using smartphones to oversee workplace operations, introducing systems to support remote operations, monitoring gas concentrations, and introducing measures to prevent accidents by installing sensors near heavy equipment.



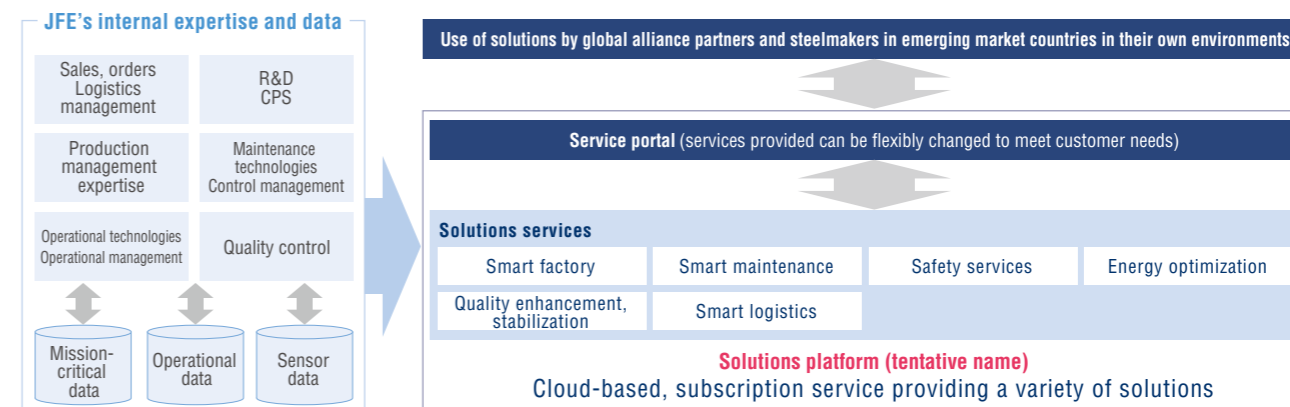
## Raising productivity through development and introduction of robots

We have developed the world's first autonomous Ultrasonic Testing Robots (UT-Robots) for inspecting steel plate and introduced an off-line testing process for steel plate using these robots. By automating manual testing operations we have achieved even higher levels of detection reliability and operational efficiency. Three of these robots have been introduced at a steel plate plant in the East Japan Works' Keihin district. Going forward, we intend to use these robots at steel plate plants at the West Japan Works (Kurashiki district, Fukuyama district), as we strive to further increase the quality of our steel plate while also making operations more efficient.



## External service sales platform to support development of solutions business

We are exploring a "sales platform" to serve as a foundation supporting the solutions business being developed by the Global Business Development Division. This structure would use JFE's accumulated data to provide solutions to customers who conclude subscription contracts for the service. We are considering providing a "service portal" that takes into account customer convenience and secure connections with customers' systems, a cloud-based approach that would allow the portal to be used around the world.



- Building platform** that will be foundation of core new growth strategy of "solutions business"
- After completing construction during period covered by Seventh Medium-term Business Plan, **earnings from "solutions business" to be three times those of FY2020**
- Services provided by **subscription** via service portal **without disclosing core technologies**

## JFE VOICE !

### Pursuing robot development to automate plant operations and raise labor productivity

The Cyber-Physical System R&D Department's Robotics Group is working on the introduction of robots and automation based on mobility robot technologies. When we were developing the autonomous UT-Robots for inspecting steel plate, we frequently visited plants and talked with operators to address both technologies and plant operation. Going forward, we aim to increase added value at manufacturing sites by using DX to resolve issues in a variety of areas at manufacturing sites.

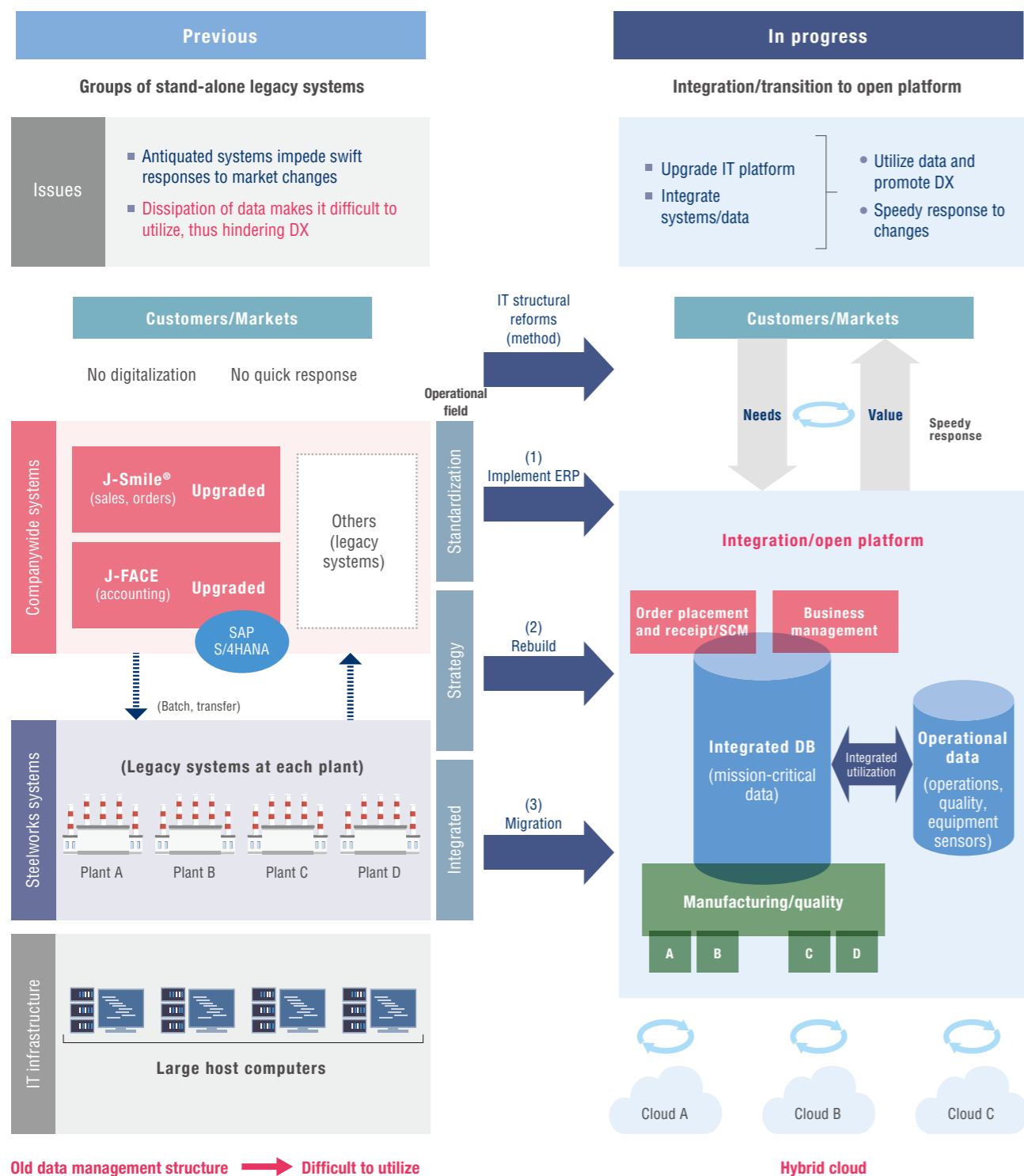
Masaki Kobayashi, Cyber-Physical System R&D Department, Steel Research Laboratory



## Enhancing an information system platform for DX promotion

JFE Steel is restructuring its IT platform to be able to make use of the wealth of data assets that is the core of the DX strategy. By integrating legacy systems and converting to an open platform architecture, we are building a foundation from which to respond speedily and flexibly to environmental changes. Companywide mission-critical systems for sales and orders and accounting have already been upgraded, with the remainder to be standardized during the period of the Seventh Medium-term Business Plan, with approaches like enterprise resource planning (ERP) used in the migration. We are also pursuing mission-critical system updates at steelworks to achieve an IT structure that is highly flexible in responding to changes.

### Upgrading legacy systems to build an IT platform that enables advanced use of data (= data-driven)



## Project to convert head office mission-critical system to open platform

We expect to complete the transformation of all head office mission-critical systems, including the J-Smile® system for sales and orders, to an open platform architecture during fiscal 2021. Shifting to an IT platform with a high degree of expandability will make it possible to address business needs flexibly in the mission-critical operational areas of business management, purchasing, sales, manufacturing, and logistics.

## Restructuring accounting-related systems by introducing ERP

We have completed the migration of the head office accounting system to an open platform architecture by introducing ERP. In addition to accounting, we have been working to install ERP packages in equipment planning and research and development systems to reform those operations. Using work-flow and electronic approvals to make operations paperless, we have contributed to work-style reforms through greater operational efficiency by automatically linking data that had previously been managed manually.

## System updates at steelworks

By migrating steelworks' mission-critical systems to open platform, we aim to create new value and reform work styles with an operational platform that allows "all employees to share and use all information." Building on small successes beginning with the order receipt function at the Fukuyama district, we intend to have the system up and running at the Sendai Works during fiscal 2022 (the first entire steelworks to do so). We will then work to accelerate the process by rolling out to other projects the development process and expertise gained.

Head office	Steelworks					
	Kurashiki	Fukuyama	Chiba	Keihin	Sendai	Chita
<b>Open platform project</b> Sales, manufacturing, logistics	<b>System updates at steelworks</b> Manufacturing management, operational management					
Marketing Logistics	Upgrades scheduled for completion during periods covered by 7th and 8th Medium-term Business Plans					
Upgrade scheduled for completion during FY2021	Upgrades scheduled for completion during periods covered by 7th and 8th Medium-term Business Plans					
<b>Open platform project</b> Business management	<b>Open platform project</b> General administration					
Upgrade completed in 2021	Upgrades scheduled for completion during periods covered by 7th and 8th Medium-term Business Plans					

Open structure process

- Restructuring and migration
- ERP installation

## JFE VOICE !

### Contributing to new system launch at the Sendai Works and coordinating with manufacturing sites

The Sendai Works will launch its new system in fiscal 2022, the first for all production centers. Using the personal connections and expertise of the manufacturing management and operational technology divisions involved to date, we have helped align the new system with frontline manufacturing sites. We are moving forward toward the Sendai Works being fully integrated with a system for creating new value.



Fuminori Takeuchi, Tasuku Endo, Kengo Goto, Business Process Innovation Team

### Sendai Works' system update

Migrating to open platform architecture by making maximum use of expertise and processes accumulated over time

Cloud-based IT platform → Advanced data use for DX propulsion → Operational improvement

