Servicing technology

Servicing Technology Contributing to the Realization of Business Model Transformation

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Abstract

Kobe Steel designs, manufactures, and sells custom-made, non-general-purpose industrial machinery and plant equipment. These products are typically used in our customers' manufacturing sites for 25 to 50 years. Even after the sale, Kobe Steel has continued to provide support through various technology consultations and cooperative assistance in all aspects of its customers' manufacturing endeavors, ranging from equipment inspection and parts-replacement to overhauling, under the framework of after-sales services. The servicing technology results from advancing After-Sales Service Business DX within the company. It aims to create a platform that facilitates smooth and efficient communication and collaboration among stakeholders, including customers, using ICT to establish an ecosystem as a new business model.

Introduction: The origin of servicing technology

Kobe Steel designs, manufactures, and sells custom-made, non-general-purpose industrial machinery and plant equipment (production products) that support our customers' manufacturing endeavors. These products require high performance, high reliability, longevity, and design specifications that are unique to each customer. These products are typically used in our customers' manufacturing sites for 25 to 50 years. Even after the sale, Kobe Steel continues to provide support through parts replacement, technology consultations, and cooperative assistance under the framework of after-sales services.

Because our product portfolio encompasses unique specifications, our after-sales services cover everything from maintenance (e.g., inspections and parts replacement) to overhauls (e.g., overhaul inspections and repairs requiring temporary shutdown). Kobe Steel has helped optimally manage customers' production operations in its role as an industrial machinery manufacturer.

However, after-sales service has been challenging to standardize within Kobe Steel. These services are highly individualized, based on the product and the person involved.

The industrial sector is undergoing a paradigm shift from products (*monozukuri*) to services (*kotozukuri*). Against this backdrop, it is imperative to promote DX (digital transformation) in the after-sales service business. This leverages our strengths as a manufacturer and will transform our business structure from a traditional manufacturing-centered business to one that blends products and services and offers continued customer support (after-sales service).

Servicing technology arose following Kobe Steel's internal promotion of DX in its after-sales service business.

1. Components of servicing technology (organizational capabilities and wisdom within the KOBELCO Group as a source of technology)

Servicing technology came to life after internally promoting DX in the after-sales service business. Kobe Steel has honed three particular organizational capabilities in the course of running an international business developing and distributing non-general-purpose industrial machinery and plant equipment. Moreover, we have used ICT to develop these capabilities into business systems.

The first capability is a method for training and managing service sites and service engineers on a global scale, which serves to provide technical support to customers of Kobe Steel products. The second, a method for managing service expertise and quality control, capitalizes on expertise and methods handed down through generations of specialists across more than 100 years of manufacturing. The third comprises equipment and machinery maintenance methods, developed through collaborative value creation with customers during after-sales service to ensure that customers' equipment and machinery will remain dependable for a very long time. Servicing technology involves the use of ICT to turn these capabilities into business systems/platforms.

The coming sections provide an overview of each servicing technology element.

2. Servicing technology 1: Platform for training and managing service sites and service engineers on a global scale

Kobe Steel's construction machinery business supplies excavators, cranes, and other construction

machinery to construction sites, public works operations, mines, and quarries around the world. Construction machinery plays an invaluable role in the creation of societal infrastructure in emerging economies. Such economies use machinery differently than in Japan, and inside of longer operating hours. As such, responding to the speed of economic development in emerging countries necessitates prompt and effective technical support when issues with a machine occur. Therefore, it is important to quickly assemble service sites and qualified service engineers who can maintain Kobe Steel's construction machinery, and to establish a technical support network.

The construction machinery industry has expertise in the development of technical support networks that function on a global scale. We have been building an international ICT platform for service sites as well as a method for service engineer training and management that incorporates accumulated expertise and data from construction machinery with IoT capabilities. In 2016, Kobe Steel began developing a training system that combines online (e-learning) and in-person training within each area of our construction machinery business. We created an ICT-based method to automatically generate a stepwise training plan for prospective service engineers in the form of a training menu based on their work experience and skills. The system has been in operation worldwide since 2018, efficiently and effectively training and managing service sites/service engineers even with limited trainers in each market (**Fig. 1**).

Unlike our competitors in the construction machinery industry, Kobe Steel is a conglomerate company. We have been developing our ICT platform, which has proven effective in the construction machinery business, into a standard tool that can be deployed horizontally across the after-sales service business of our non-general-purpose industrial machinery and plant construction businesses.

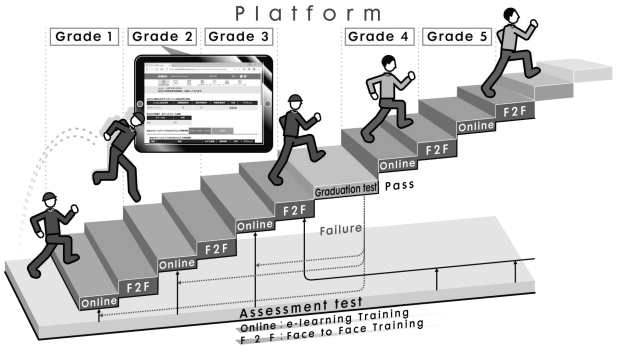

Fig. 1 Service engineer training system

3. Servicing technology 2: Platform for managing service expertise and quality control

Industrial machinery and plant equipment (production products) are generally costly and therefore must be reliable and long lasting. This is why Kobe Steel provides maintenance services to periodically inspect and overhaul customers' equipment and implement countermeasures as necessary. Notably, the production products Kobe Steel provides often serve as core equipment in manufacturing operations, so equipment shutdown for maintenance entails lost production. Therefore, maintenance must be performed within a minimal timeframe and without error. Root cause analysis regarding abnormalities must also be executed early for quick resolution of issues.

Manufacturers must train and mobilize personnel who can communicate with customers about the status of their equipment and implement initial countermeasures. This concept is part of the on-site servicing Japanese manufacturers have performed for many years. Kobe Steel's employees work in production for a certain period before being dispatched to customers' sites for equipment maintenance. Knowledge is transferred through OJT (on-the-job training), based on information accumulated and passed down from generation to generation. However, the methods of passing knowledge down have not been formulated into a standard procedure.

In 2017, Kobe Steel began using ICT to visually depict maintenance expertise communicated through generations of technicians in the machinery business. The company has also launched an initiative to improve maintenance service quality by connecting all stakeholders of maintenance work, including the customer, in a virtual ICT environment.

This initiative promotes the development quality indices related to equipment inspection and maintenance work based on manufacturers' knowledge and equipment design. Maintenance processes and content can be reconfigured based on these indices. The ICT platform developed supports collaborative maintenance service, in which optimal equipment maintenance plans are discussed and implemented, and the content and results of service provision are agreed upon by the customer (visualization of the servicing process) (**Fig. 2**).

The platform is already in use as a service management system for our industrial machinery and plant construction businesses. It connects customers and business partners, unifying service sites and service engineers as the global KOBELCO

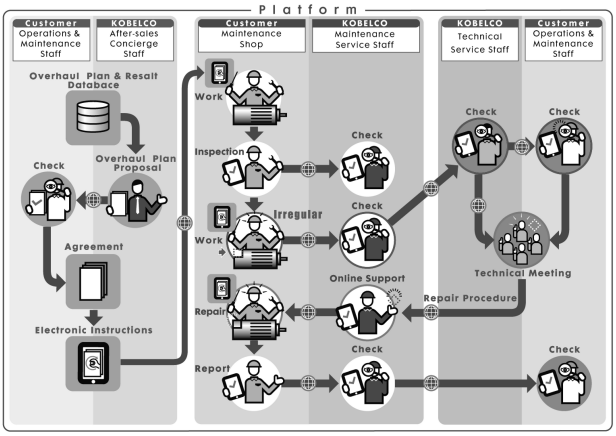

Fig. 2 Service operation system

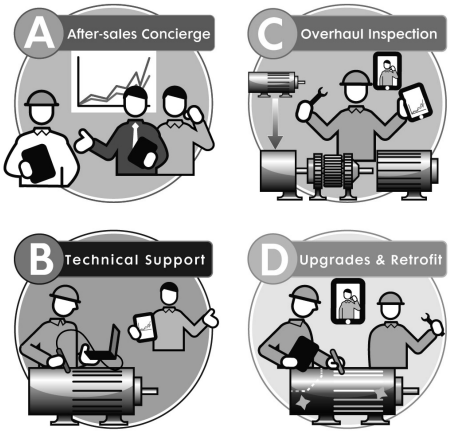

Fig. 3 After-sales service menu

After-Sales Service network. This ensures the continuous and stable operation of Kobe Steel's industrial machinery and plants around the world.

4. Servicing technology 3: Equipment and machinery maintenance method platform

Services differ from goods in that they are processes performed by people. Therefore, to provide services effectively, it is important to develop and manage the people and organizations that provide services, visualize the environment in which services are performed, and ensure quality. We have used ICT to meet these objectives in developing our platform for training and managing service sites and service engineers on a global scale as well as our platform for managing service expertise and quality control.

It is also notable that services are challenging to plan and supply in the same way as goods, and that service operations are difficult to scale. We continue to provide support through various technology consultations and cooperative assistance in all aspects of our customers' manufacturing endeavors, ranging from equipment inspection and parts replacement to overhauling, under the framework of after-sales services. As part of this support, we provide value by working with our customers to develop maintenance menus (**Fig. 3**) with the goal of ensuring that their machinery and equipment will be dependable for as long as possible. The equipment and machinery maintenance method platform hosts these maintenance menus and serves as a mechanism for developing and providing them.

We capitalized on our strengths, such as having multiple industrial machinery portfolios, in applying DX to Kobe Steel's in-house service operations. We used agile methodology (state-of-the-art method for systematic development) to uncover the equipment maintenance methods amassed as organizational

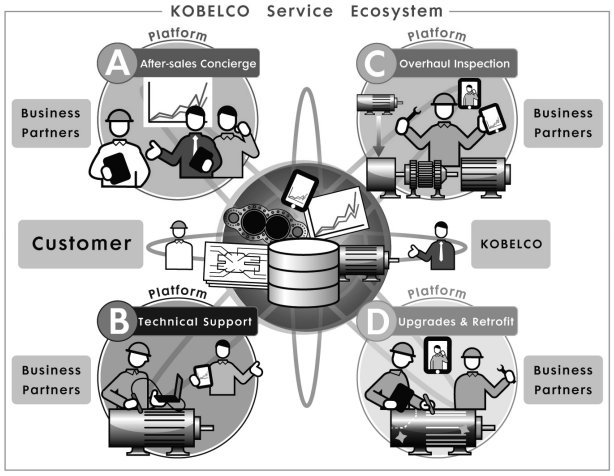

Fig. 4 KOBELCO service ecosystem

knowledge for each industrial machinery after-sales service business. We first created a platform based on the content and processes related to the after-sales services of one industrial machinery product portfolio. This established a benchmark to reveal and analyze the content and processes of the after-sales services of other product groups. Our ICT platforms are a mechanism for compiling and unifying service menus, establishing a service ecosystem (**Fig. 4**).

The service ecosystem creates a home for published and unified maintenance methods and content (processes and procedures) amassed within Kobe Steel for customers' equipment. Service sites and service engineers can access this information via an ICT platform, thus promoting after-sales service in collaboration with business partners around the world to ensure the continuous and stable operation of our customers' manufacturing operations. In this way, the platform enables collaborative value creation by serving as a business ecosystem. New value is added to society by connecting us, our customers, and our business partners together, in a system that incorporates the technologies of our business partners.

5. Initiatives to strengthen the after-sales service and business model of the Kobe Steel machinery division

This section introduces initiatives to strengthen the after-sales service and business model of the Kobe Steel machinery division, with the objective of making the KOBELCO Group the first choice every time and promoting DX in our service operations.

Those involved in after-sales service within Kobe Steel traditionally viewed this part of the business as an ancillary means of securing product sales. The understanding that service provides value in the same way as products (goods) had not taken hold. Defining the value provided was ambiguous, particularly because the delivery of services occurred in a non-standardized manner. We began our promotion of DX in service operations by redefining the value provided - that is, by defining the content behind the value provided. We then used ICT to visualize the processes related to providing value (platform development). Next, we used the platform as a benchmark to analyze our after-sales service and business model.

Our DX efforts confirmed that although the service content of A through D in Fig. 3 represents the core added-value domains of custom-made, non-general-purpose industrial machinery, each industrial machinery product requires individualized service content and methods. Kobe Steel's industrial machinery products can be broadly classified by (1) the number of machines supplied to the market, (2) the level of expenditure for service, and (3) the service provision system. The services that can be expanded and enhanced to maximize revenue in the after-sales service business differ from one group to the next, as do the effective marketing methods (approaches to customer retention).

The differences between industrial machinery products in terms of the content and methods for providing service and for marketing to maximize revenue stem from how the product is used, its importance within the customer's plant, and its structural characteristics. With the goal of ensuring that the KOBELCO Group is the first choice every time, this information has been shared as organizational knowledge, leading to quality improvements in after-sales service. A further result of our endeavors is the mindset shift among staff away from service provision in an individualized manner, and toward viewing service as a collaborative activity to create new value with the customer.

As an organization develops, work is iteratively standardized and streamlined, with the resulting processes and routines coalescing in the form of organizational capabilities and wisdom.

Kobe Steel promotes DX in service operations by using ICT to quickly and effectively uncover organizational knowledge passed down over the years as part of on-site service provision. Shared platforms that aggregate this wisdom fortify the after-sales service and business model of our machinery business and shift the mindsets and working methods of service staff.

Conclusions: Toward the future

Our servicing technology is a medium to connect with our customers in terms of *monozukuri* (creating products) and *kotozukuri* (creating experiences). Alongside these concepts, improving our partnerships with our customers, gaining their trust, and deepening our relationships with our business partners all foster the KOBELCO Group's materialities of ensuring safety and security in community development and manufacturing, providing solutions for the future, and contributing to a green society.

As a manufacturer, Kobe Steel is well versed in the key technical points supporting optimal operation and maintenance of the non-general-purpose industrial machinery and plants we develop. Creating a business ecosystem for sharing this knowledge, experience, and expertise as Team Kobe, Team Hyogo, Team Kansai, Team Japan, or any other team is how we will expand our services from those for Kobe Steel's customers, to those for our partners' customers, to those for society. This ensures safety and security in community development and manufacturing.

Kobe Steel provides industrial machinery and plants that serve as core equipment in manufacturing. This equipment is operated and maintained all over the world by our customers' employees, their business partners, and the companies in their surrounding areas. Part of our business model of providing solutions for the future involves promoting safety and security in community development and manufacturing in collaboration with our customers and business partners through a business ecosystem that creates new value and supports innovation.

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