

## Innovations in *Monozukuri* and R&D (Message from the CTO)



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Promoting innovations in *monozukuri* and R&D aimed  
at expanding organic growth

### Targeting expansion of organic growth

#### Innovations in *monozukuri* and R&D

The main theme of our Fiscal 2018 Medium-Term Management Plan is to expand the business globally while improving profitability. On the business expansion side, we are targeting revenues of ¥1,120 billion in fiscal 2018, and on the profitability improvement side, we are targeting an adjusted operating margin of 10.7%. These are very aggressive goals, and the key to reaching them is to expand organic growth. To achieve such expansion, we must solidify our base as a manufacturer and strengthen our ability to deliver sustainable growth.

Recognizing the challenges involved here, we will pursue dramatic innovations in *monozukuri* and R&D under the Medium-Term Management Plan. I regard innovations in *monozukuri* and R&D as an issue that should be addressed in a cross-organizational manner from a medium- to long-term perspective. As CTO, I will lead the project, and I hope to deliver swift results.

To become the world's leading high-performance materials company, we will steadily implement innovations in *monozukuri* and R&D.

#### Innovations spearheaded by our corporate department

During the period of the previous Medium-Term Management Plan, we expanded the scope of our operations through M&As, but some existing businesses started to languish. We believe one cause was a recent slight weakening of our *monozukuri* and technological development capabilities, which represent a key strength of the Group. For some time, we have managed our operations under the company system, and the company function (a vertically aligned function) became too strong. As such, problems related to *monozukuri* and R&D occurred.

On the *monozukuri* side, for example, human resources are stationary, which limits their horizons and causes technological innovation to languish. The impact of this extends to the pass rate of product quality inspections and production volume, both of which are important for us as a manufacturer. In particular, creating our products involves the use of high-quality materials and wide-ranging processes, so improving product quality and production volume has major positive repercussions.

Also, on the R&D side, we noticed shortcomings with respect to selecting research themes and building related systems from a medium- to long-term perspective. To dramatically solve such problems, we shifted from a traditional system spearheaded by our business companies to one in which the Technology, Research and Development Division, a corporate system, spearheads innovations in a cross-organizational manner.

Efforts aimed at ensuring world-class *monozukuri* skills and R&D capabilities also help energize employees. Moreover, cash generated from improvements in *monozukuri* efficiency and productivity can be invested in R&D and growth segments, the results of which can be used to further reinforce *monozukuri*. Creating this virtuous cycle to expand organic growth is a major objective of these initiatives.

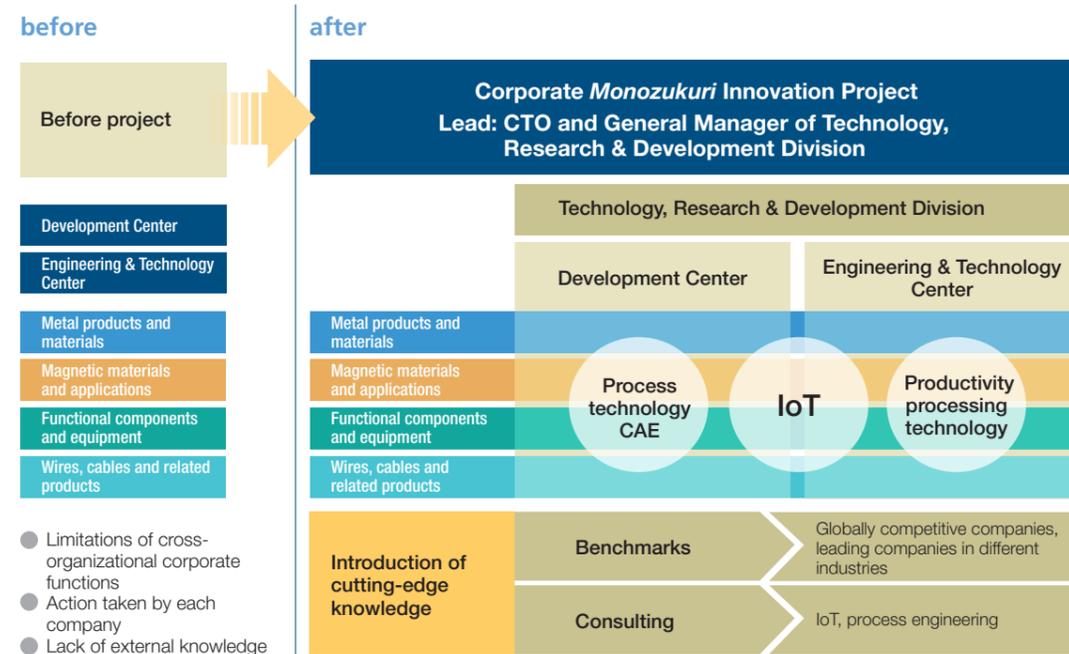
## Corporate *Monozukuri* Innovation Project

### Introducing innovative technologies; sharing issues and results

In October 2015, we began preparing for our Corporate *Monozukuri* Innovation Project, which began in earnest in April 2016. Spearheaded by the Technology, Research and Development Division, we are engaging in GEMBA (workplace) and manufacturing technology innovations based on cross-organizational and medium- to long-term perspectives. In addition to identifying latent technologies possessed by each of our internal companies that can be applied at other companies, we will build *monozukuri* skills that are among the best in the world by actively introducing innovative technologies in five segments: process technology, CAE<sup>\*1</sup>, IoT<sup>\*2</sup>, productivity, and processing technology.

\*1 CAE (computer-aided engineering): Using computer-based simulations to verify whether or not a designed structure would meet performance requirements, even before it is built.

\*2 IoT (Internet of Things): Connecting various "things" (not just IT devices) to the Internet to establish mutual communication and thus enable automatic recognition, automatic control, remote measurement, and other tasks to be performed.

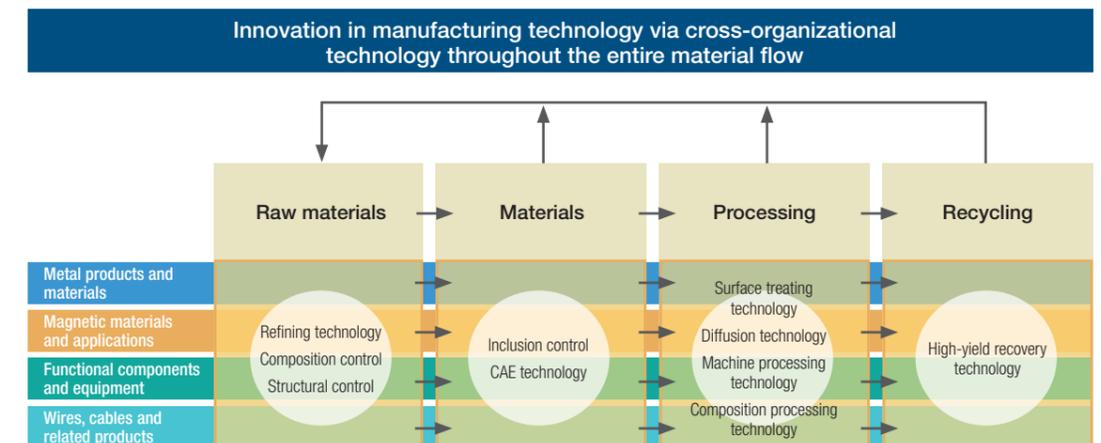


Specifically, we will promote the sharing of technologies, issues, and results between companies at the various material flow stages common to all of our business companies: raw materials, materials, processing, and recycling.

For example, casting components have become more and more complex in shape in recent years, so creating new models requires significant cost and time. By actively introducing CAE tools, however, we can make drastic improvements. Through analyses and simulations of casting requirements, we can shorten prototype production times and swiftly get new products up and running. We will share the results of these endeavors between business companies and convey them to our factories.

Moreover, with increasing numbers of high-performance products and specialty products, in-house machine processing of components becomes an important priority. We already make products requiring highly precise technologies in-house, including aircraft components and HERCUNITE™ components. Now, we will reassess machine processing for other products and rebuild our production systems and processes to further promote in-house manufacturing.

Aiming to expand organic growth,  
we will make fundamental *monozukuri* innovations  
and strengthen R&D with a sense of speed.



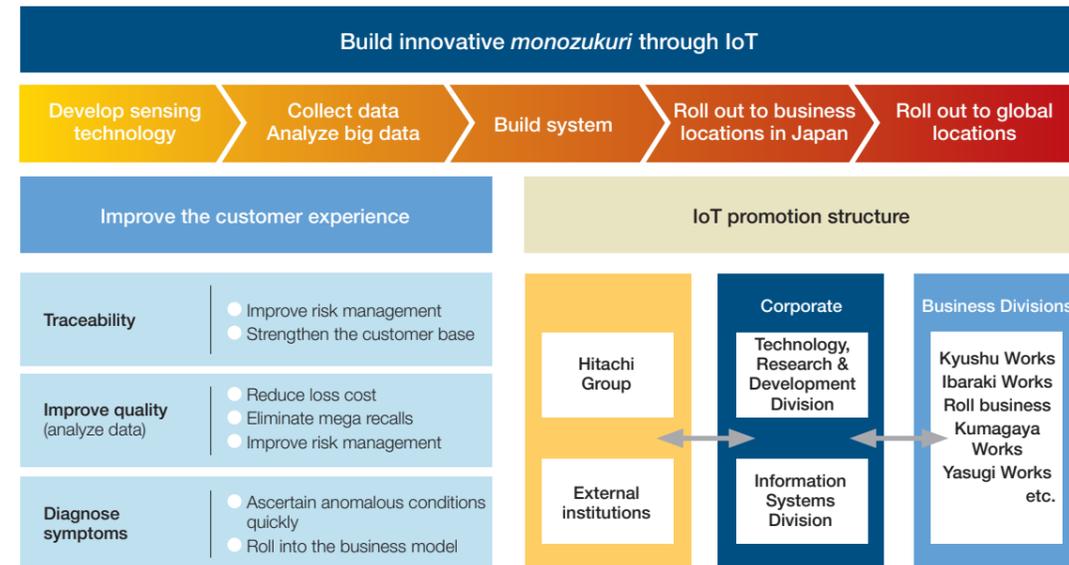
Stepping up recycling is also a pressing issue. For the Hitachi Metals Group, which handles large amounts of expensive raw materials, including rare metals and rare earth materials, recycling is an important way to reduce costs. We also have numerous engineers who are well versed in such processes as smelting and refining, so we are able to establish in-house technologies to recover high-quality materials efficiently. In October 2015, we launched a research project to promote in-house recycling at all four business companies. Through this project, we will reduce material costs while simultaneously addressing the risk of fluctuating supply volumes.

In addition to introducing innovative technologies, we will share the issues and results of technologies common to the four business companies, as we plan to dramatically solve issues related to *monozukuri*.

### Seeking to establish innovative *monozukuri* with IoT technologies

In its manufacturing processes, the Hitachi Metals Group has traditionally tended to rely on the experience of its technicians to accumulate know-how. Accordingly, we were falling behind in some areas, such as data collection and automation. To solve these issues, in fiscal 2016, the Technology, Research and Development Division and the Information Systems Division launched an effort to promote interaction between the Group's business divisions and introduce knowledge and human resources from external entities, including the Hitachi Group. We also established an IoT promotion structure to promote the use of IoT in *monozukuri*.

IoT technologies are particularly valuable in the aircraft and energy segments, where risk management through traceability and investigation of malfunctions are required. We will introduce IoT technologies at all stages, including predictive diagnosis of product defects and management of component replacement periods. By visualizing a variety of scenarios in this manner, we will achieve innovative *monozukuri*.



### Innovations in R&D

#### Aiming to become a true development-driven corporation

In addition to innovations in *monozukuri*, we are pursuing major innovations in our R&D. For high value-added products handled by the Group, there is always a threat that innovations in materials and technologies may lead to those products suddenly becoming superseded by next-generation offerings. To achieve sustainable growth, corporations that handle high-grade, highly functional materials must constantly envisage the future, accumulate technologies, and become development-driven corporations that spark their own innovations. For this reason, we launched new business creation tasks to envisage the next ten to twenty years and expedite R&D from a cross-organizational business perspective.

Through our new business creation tasks, we are currently looking for opportunities arising from various "threats" in each business segment.

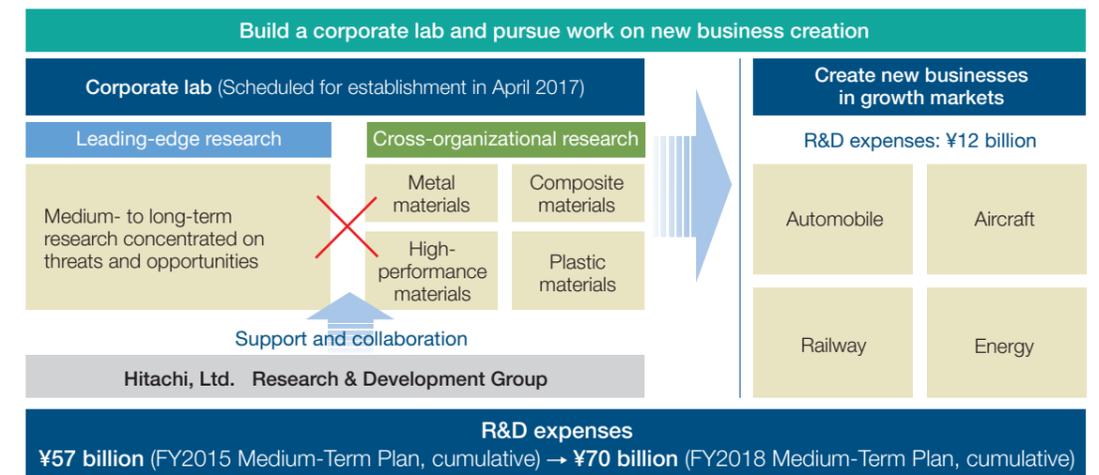
In the near future, for example, we need to monitor the emergence of additive manufacturing (3D printing) in the domain of molded materials. In the future, composite materials will also be deployed in ultra heat-resistant steel used in the aircraft and energy segments. We predict that rare earth magnets will be replaced by new magnets and, due to the need for weight reduction, iron castings will be replaced by composite materials and multiple materials. Even wires, cables and related products will undergo technological innovations, such as aluminum conductors and compound conductors.

With these medium-to long-term threats and opportunities on the horizon, our new business creation tasks have identified 15 product-development themes to be handled on a cross-organizational basis from now until 2025. Depending on the theme, we will bring together human resources, including from the Hitachi Group, to interact with the R&D divisions of each business company and with external institutions to establish an R&D system befitting a true development-driven corporation.

In April 2017, we will establish our Corporate Research Lab to further bolster R&D innovations.

Under the Fiscal 2018 Medium-Term Management Plan, we will raise R&D expenses to ¥70 billion, from ¥57 billion under the previous plan. Of the ¥13 billion increase, we will allocate ¥12 billion to new business creation tasks.

### Achieve reform from the medium- to long-term and cross-organizational business perspectives



### New, strong, world-leading *monozukuri*

#### Mission: Innovations in materials technologies and manufacturing process technologies

The Hitachi Metals Group has extensive know-how in developing original technologies and high value-added products, and by forging innovations in manufacturing technologies, it is laying the groundwork for the future. We are in a good position to drive innovations in materials technologies and manufacturing process technologies.

To become the world's leading high-performance materials company, our *monozukuri* itself must be at a world-leading standard. By pursuing innovations in *monozukuri* and R&D, we will reinforce the Hitachi Metals Group's operational foundation from its core.