

# Research and Development that Provides More New Choices for Society

Transforming the way we do R&D to create new value and commercialize it faster

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The IHI Group has been envisioning various future possibilities in the face of complex social issues, cultivating technologies in cooperation with various partners, and continuously working to develop technology that provides new value. In order to promptly deliver such value to the market in the form of products and services, we aim to update the way of research and development and to “Create a World where Nature and Technology Work in Unity,” which is one of our management philosophies.

## Introduction

In the face of global climate change, people’s sense of value toward social economy systems surrounding energy has been rapidly changing. Amid such change, we believe that continuing to provide new value while giving more consideration to nature and society than ever before is the IHI Group’s reason for existing. To do this, we need to face environmental and social issues, predict their impacts on the future global environment, find what products and services are required in such an environment, and provide them to society as an early adapter. For this reason, the IHI Group has been upgrading the conventional way of technological development, which is promoted mainly by the Corporate Research & Development Division. Here, I would like to introduce how we have been transforming our technological development style.

## Transforming the way we do R&D

To date, we have been aiming to provide high-value-added products and services through the development of our fundamental technologies and cooperation with business divisions or affiliated companies. But the future will demand that we promote technological development with a higher purpose and faster than ever before to devise new technologies and fields of business. In response, we intend to transform how we develop technology through the following innovations:

- (1) Apply the approach of system design and management (SDM) to enhance planning capabilities
- (2) Take advantage of digital technologies to accelerate technological development
- (3) Play a part in the world’s ecosystems and make the most of each other’s strengths

## Applying the approach of system design and management

To find ideas that will lead to new solutions, we need to create a new way of thinking rather than just rely on previous business experience or application of our own technologies. As such, we decided to apply the idea of SDM, which is based on system thinking, design thinking, and project management, into the planning process.

Specifically, the process operates as follows. First, we select an issue as a theme, identify stakeholders relevant to the issue and their behavior, and put these in chronological order. This enables us to visualize the details of conditions or situations responsible for the issue and extract problems to solve. Next, we gather staff members with different kinds of expertise or experience, and then discuss potential solutions and come up with various ideas. Then, we evaluate these ideas quantitatively from the perspective of technological competence and economic efficiency, and set a solution for which we work on technological development. Then, we verify whether the concept of the set solution works well in society together with the stakeholders and put it into a clearer picture that can provide new value to society.

Practicing this process requires deciding the appropriate timing to use marketing skill, including skills in conducting environmental analysis, and expertise in thinking processes including SDM, insight into the future, and service design. In the Corporate Research & Development Division, we accumulate practices and build planning processes together with group-wide members with a variety of knowledge and expertise to envision new strategies.

## Digital technologies that accelerate technological development

To accelerate the evolution of ideas about new solutions into tangible forms and provide them as products or services to society, we need to reduce the amount of time it takes to bring these ideas to the market once they are created. So, we decided to further promote introduction of digital technologies. Taking a look at some examples of them, we utilize model-based development (MBD), materials informatics, and multiphysics simulation. MBD is a development approach that uses simulation technology and can reduce lead times and costs for development. Materials informatics helps us improve development efficiency in materials development, where we have previously repeated experiments based on past materials data, produced materials on a trial basis, and evaluated their

physical properties. As for multiphysics simulation, we use it to grasp how a system behaves as a whole with the aim of significantly reducing development time. Especially, when developing large equipment, we have previously started with laboratory-level element tests and repeated scale-up tests and numerical analyses multiple times to figure out a design that enables the equipment to deliver required performance in its actual size. By replacing some of these scale-up tests with numerical simulations, we can shorten the time required to design equipment or conduct demonstration tests.

Currently, research is underway on what MBD is necessary for technological development in the IHI Group, with the aim of reflecting the research results in actual development to realize ideas about solutions earlier than before.

## Participating in the world's ecosystems

To solve complicated social issues, we need to correctly understand and keep up with social changes, technological innovation, and other trends. To do this, we aim to participate in the world's ecosystems and the world's most advanced research and development. Collaboration between companies and research institutes that have different strengths may spur new business opportunities or movements. Indeed, some of our current technological development projects involve collaboration with overseas research institutes. In these projects, we have been taking advantage of the strengths of both the IHI Group and these research institutes to promote quality development and accelerate it. In order to expand such collaboration, we work on to broaden public recognition of the IHI Group. To this end, we are actively sending out messages to let people around the world know the goals we aim to achieve and our endeavors to promote open innovation.

## Conclusion

In response to global environmental changes and demands from society, the IHI Group has been promoting transition into an innovative technological development style. By applying the SDM approach to enhance our planning capabilities, taking advantage of digital technologies to accelerate technological development, and participating in the world's ecosystems, we will work on development that continuously provides new value with more consideration to society and the environment than ever before. Through these efforts, we aim to "Create a World where Nature and Technology Work in Unity."