

Upstream Delightful Design Methodology and Innovative Agile Manufacturing Technologies

International competition has diminished the prestige of Japan's manufacturing industry.

The goal of this SIP program is to research and develop innovative production and manufacturing technologies, adapting the results of this work for widespread use. In turn, we believe this will reinvigorate Japanese industry and create new markets—markets for which Japan can secure the dominant position. In this context, “delightful” refers to delightful quality and satisfaction. Here, this program intends to establish innovative design and production methodologies that deliver products and services offering delightful quality and performance to the consumer.

Under this banner, the program has called for project submissions, ultimately selecting 24 that are now underway.

Innovative
Design/
Manufacturing
Technologies

New Production 2020 Project

Program Director

Naoya Sasaki

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Profile

Dr. Naoya Sasaki joined Hitachi, Ltd. in 1982. He assumed the duties of corporate chief engineer in 2014. Throughout his career, Sasaki has been engaged in the development of mechatronic products and the development and spread of mechanical systems technologies and molecular simulation technologies. He has a Ph.D. in engineering. Dr. Sasaki has been named a fellow of the Japan Society of Mechanical Engineering. He serves as vice-president with the Japan Society for Computational Engineering and Science, as well as a member of the Japanese Society of Tribologists.

Naoya Sasaki

Linking Value Proposition, Design, and Concept to the Manufacturing Arena

Japan’s manufacturing industry became a global force through high-quality/high-performance materials and components, made using high-level processing technologies. More recently, however, manufacturing centers have moved overseas, and competition from emerging nations has resulted in the commoditization of what once were technologically advanced products. Price competition, in particular, has become so fierce that Japan is struggling to compete in the markets for finished goods and services.

“Over my career, I’ve had experience with the entire breadth of manufacturing, from researching simulations to product design,” says Dr. Naoya Sasaki, program director. “This is why I feel so passionate about the need for innovative manufacturing that can compete on the global stage. We need this to create a resurgence in Japanese manufacturing.”

A weakness often cited in Japan’s current manufacturing industry is the lack of communication between upstream domains (materials, components, etc.) and downstream domains (products, services, systems, etc.). Another issue is the same lack of communication between value proposition, design, and concept and the arenas of production and manufacturing.

Says Sasaki, “What consumers are looking for in products and services is not simply quality and performance, but also the sense of delight and satisfaction when they pick up a product and put it to use.” Sasaki continues, “During Japan’s high-growth period, people were delighted with their new color televisions and automobiles. But, as consumer products became more common, it became more difficult for businesses to provide interesting products that excited the consumer. To provide delight requires a close integration between upstream and downstream systems and an overall desire to create goods and services that bring new value through their use.”

“Japan is home to numerous small- and medium-sized local enterprises that can offer superior materials and component technologies. But, it’s difficult for them to translate these superior technologies into valuable products on their own. By forming a coordinated network that can take advantage of these strengths, we can create new value, and then extend these successes into other regions and sectors. In so doing, we will be able to bolster the overall underlying strength of Japan’s industry, which is the goal of the Innovative Design/Manufacturing Technologies (New Production 2020 Project) program,” explains Dr. Sasaki.

In the US and Europe, national institutes, universities, and private sector enterprises are working together on research and development, training, and the development of advanced

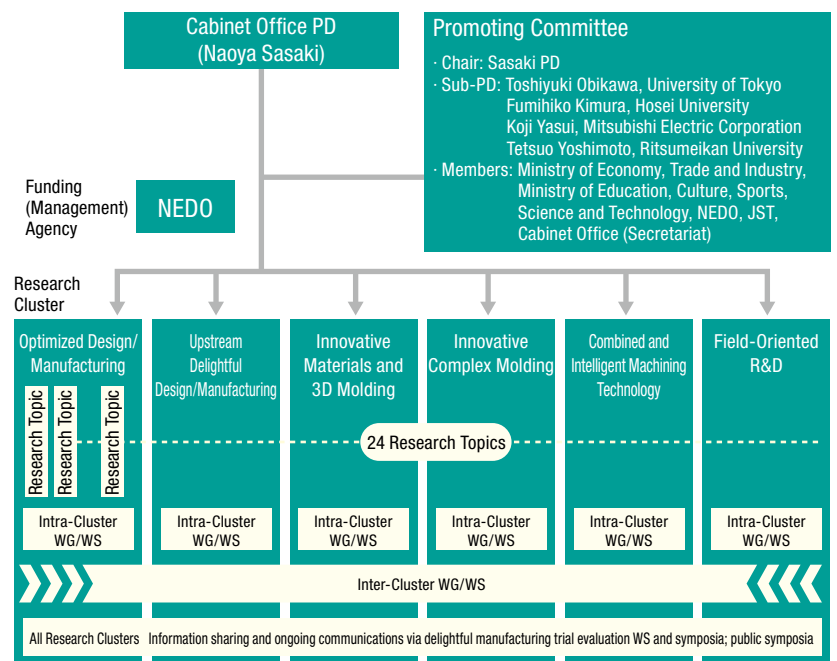
commercial production technologies. These technologies include laminating molding systems such as those seen in 3D printers. If Japan is to compete globally, then the country must be the first to establish a world-leading style of innovative manufacturing.

Needs-Based Design Methodology tied to Advanced Production Technologies

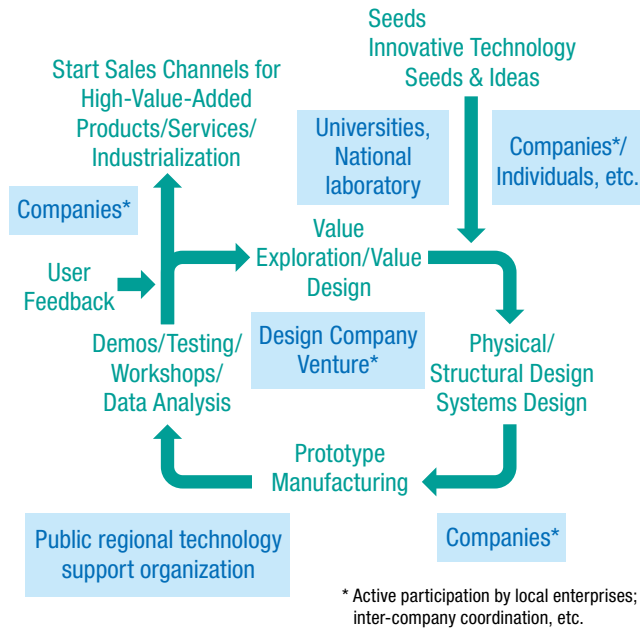
This program focuses on two research and development topics: (1) Upstream Delightful Design methodology and (2) innovative agile manufacturing technologies.

Upstream Delightful Design methodology consists of (1) Design technologies for customer-centric global utility; (2) research methodologies and assessment/simulation coordination technologies for incorporating value (customer satisfaction, performance, cost, quality) in the design process; and (3) system design initiatives that reflect product systems and services that will avoid commoditization of Japan’s traditionally strong materials and components industries. The overarching point to keep in mind is the need to establish a flexible design methodology. This methodology must consider preliminary design and a response to manufacturing conditions in the market that look beyond currently identified needs.

The idea of research and development for disruptive production and manufacturing technologies consists of developing advanced technologies for taking upstream delightful design methodology and quickly putting the results into commercial products and services. The process consists of three core components: (1) Rapid manufacturing and processing technologies for complex structures and shapes; (2) application to other fields, integration/systemization with other technologies, and advancements in current



• Implementation Structure



• Innovation Style Conceptual Overview

manufacturing and processing technologies; and (3) advanced simulations and measurement technologies to explain complex manufacturing and processing mechanisms and develop optimized control functions.

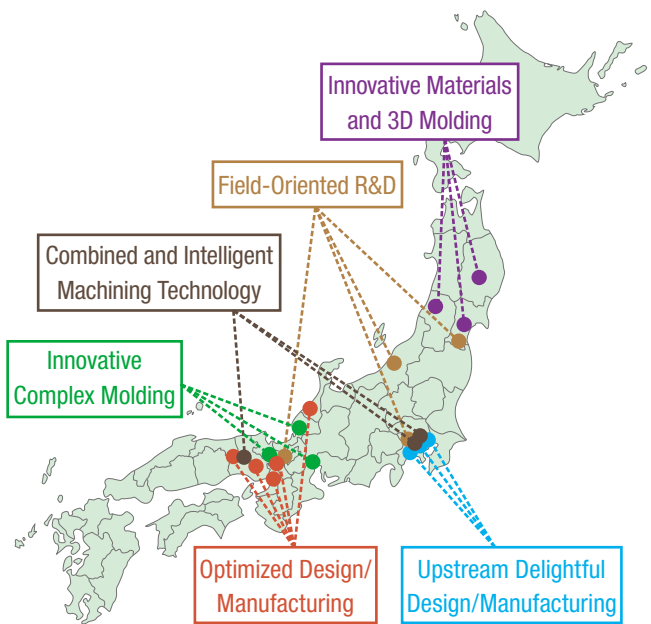
Says Dr. Sasaki, “We plan to use 3D molding and other advanced technology to develop the ability to process complex products without constraints. Our work will also lead to ways to select from materials of various composition, and to ensure high quality, low cost, and high performance through new and composite technologies.”

Sasaki further explains the goal of this program, saying, “This is what will help us establish production and manufacturing technologies to rapidly and easily test manufacture and evaluate products for practical adoption.”

New mechanisms will be required to further advance testing and implementation R&D over a range of innovation styles.

“To deliver innovation requires a new user-involved initiative,” explains Sasaki. “This is why we plan to apply our research and development results to actual production, asking companies and consumers to provide their feedback. We’ll identify the issues, and then quickly include them in our R&D loop. It’s our attempt at coming up with a new innovation style, and we think this will not only improve our development process, but also uncover added value that we never thought of initially.”

More specifically, Dr. Sasaki is looking to introduce new styles of innovation that tie together public sector research



• Regional overview of research topics (shows only research topic and location of research topic managing entity)

and development institutions with universities, which focus on basic mechanism identification studies, local communities, and private enterprises that emphasize communication in B2C or B2B settings.

NEDO (New Energy and Industrial Technology Development Organization) manages the program, having already selected 24 research topics from among those publicly solicited.

NEDO was able to select from a wide variety of proposed research fields in advanced topics, including medical and welfare, industrial products, consumer products, and energy. Many locally renowned small- and mid-sized firms participated in the call for submissions, presenting a range of R&D proposals from industrial to consumer products to services. There were a number of proposals that caught program managers by surprise, offering exciting possibilities. Overall, the program will see to it that each of the topics move forward in the manner and toward the goals originally envisioned for them. That is not to say, however, that there are established methodologies for each project.

The goal of this project is, after all, to search for and propose new R&D for better design methodology and innovative production technologies. According to Dr. Sasaki, the program anticipates a repeated cycle of improvement based on hypothesis, production trials, testing, evaluation, and feedback. He believes this system will result in innovative technologies and a new style of production that not only delivers on the original five-year goal, but also leads to ways to deliver and distribute new products and services based on this innovative manufacturing style.

Research and Development Topics

1 Establish Upstream Delightful Design methodology

Research and develop upstream delightful design methodologies providing high-quality, comprehensive system design incorporating a variety of functional design considerations, manufacturing conditions, and relevant data. This technology should be driven by needs, value, performance, delight (delightful quality), and satisfaction.

2 Research and develop disruptive production and manufacturing technologies

Research and develop disruptive production and manufacturing technologies that allow for new structures, complex shapes, greater function, better quality, and lower cost.

Exit Strategies

✓ Promote local enterprise success stories; create new industries

Publicize and promote successful commercialization by local enterprises to encourage adoption in other regions and product fields, quickly creating new industries.

✓ Build a manufacturing coordination system linking enterprises, universities, and public institutions

Build a manufacturing coordination system that can link newly developed technologies to those companies, universities, and public sector R&D institutions that can make practical use of them.

✓ Improve adoption and promotion among public-sector research and development institutions

Promote and publicize manufacturing technology for adoption into unique products in advance of the Tokyo Olympics and Paralympics.

Promote R&D successes by introducing research results to public sector research and development institutions.

Our goal is to rapidly turn concepts into products for evaluation and feedback, creating a new style of manufacturing in the process.

Create new markets in which Japan can secure a dominant position

