

CHAPTER



5

EARTH, PEOPLE,
AND SOCIETY

Mazda believes that both quality improvement and the exploration of partnerships for "co-creation with others" provide an essential foundation for its endeavors to solve issues faced by the earth, people, and society.



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Earth, People, and Society

QUALITY IMPROVEMENT

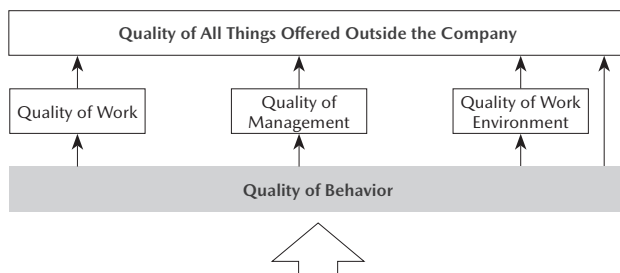
Basic Approach

Toward the realization of its Corporate Vision,*1 Mazda believes that it is important to enhance the quality of "all things offered outside the Company," including products and services, to satisfy customers. The Company defines the Five Types of Mazda Quality: "quality of work," "quality of management," "quality of work environment," "quality of behavior," and "quality of all things offered outside the Company," which is underpinned by the preceding four. In line with its quality policy, Mazda further advances the efforts it has made and promotes united collaboration among all areas, continuing to enhance Mazda's unique value.

Mazda Quality Policy

To enrich the lives of our customers by providing products and services that reflect steady and uncompromising work

[Five Types of Mazda Quality]



[Mazda Way]

Integrity, Basics/Flawless Execution, Continuous Kaizen, Challenger Spirit, Self-Initiative, Tomoiku, One Mazda

Approach to Quality Improvement

To deliver customers safety, trust and excitement through automotive lifestyles, and to have customers continuously realize the value of its products, Mazda positions customers as the starting point of all of its business activities and makes Groupwide efforts based on the three principles below:

1. Establishing consistent quality, from planning to production
 2. Early detection and early solution of market problems
 3. Quality assurance does not conclude unless the quality includes not only the outward appearance of products but also the processes used by customers
- To put the above into practice, Mazda works hard to develop personnel who thoroughly understand its customers, and can think and act in accordance with the belief that everything starts with the customer.

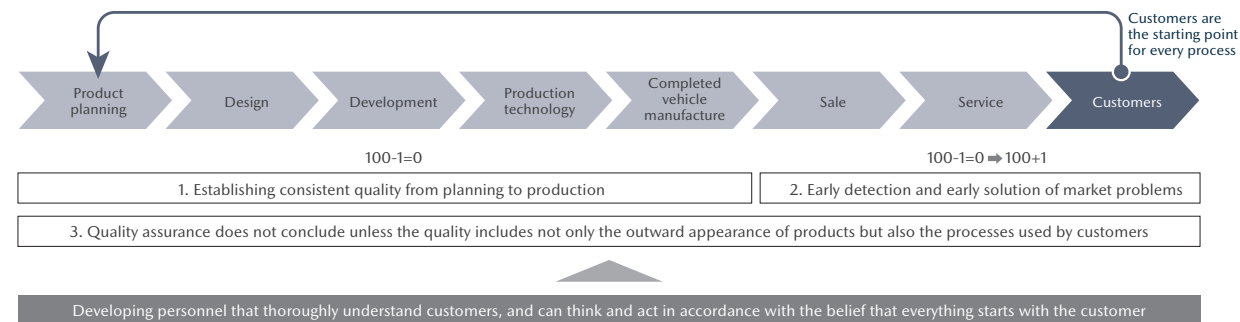
Vision for Quality Assurance

Vehicle production based on the "100-1=0" belief

1. Establishing consistent quality from planning to production: "100-1=0" expresses Mazda's strong desire to provide good quality to all customers under the belief that if even only one out of 100 vehicles is found to be defective, the car has no value for the customer. Mazda pursues a kind of vehicle production that respects each vehicle as a certain customer's "one-and-only," and aims to achieve zero defects. In keeping with the basic principles of manufacturing and based on a full understanding of its mechanisms, all related departments work in close collaboration to establish consistent quality in all processes, from planning to production.

Initiative for the process to change "100-1=0" to "100+1"

2. Early detection and early solution of market problems: If an unpredictable problem arises in the market, it may result in loss of trust from customers ("100-1=0"). To avoid this, Mazda promotes quality assurance activities for the early detection and early solution of any trouble pointed out by customers.
3. Quality assurance that covers every process up to use by the customer: To provide customers with satisfaction through an enriching car ownership experience, Mazda values customer voices all over the globe as its greatest asset. The Company is working to store this feedback in knowledge databases, and to reflect it in product planning, development, and elsewhere.



*1 https://www.mazda.com/globalassets/en/assets/sustainability/policy/corporate_vision_e.pdf

| Mazda Quality Management System (M-QMS)*1

To make faithful and unceasing efforts and constantly ensure quality in products, sales and after-sales services that can always satisfy the expectations and trust of customers, Mazda has established the Mazda Quality Management System (M-QMS) based on ISO 9001,*2 and has applied it to the series of processes from product development to production, sales and after-sales services. At overseas production sites, Mazda also promotes the establishment of systems that encourage local employees of new sites to make self-reliant efforts to improve quality, and encourages them to acquire ISO 9001, thereby promoting the quality improvement of Mazda vehicles, which are produced and sold worldwide.

Acquisition of ISO 9000 Series

Year of Acquisition	Types of ISO Certification	Certified Organization, Product, Service, Etc.
1994	ISO 9002	Mazda Motor Corporation: Vehicles produced at Hiroshima Plant and Hofu Plant (First to be certified as Japanese automaker)
1996	ISO 9001	Mazda Motor Corporation: Engineering, product development, manufacturing and after-sales service
2001	ISO 9001	Mazda Motor Corporation: Accessories, KD, product planning, design Mazda Engineering & Technology Co., Ltd.: Specially equipped vehicles (TESMA), etc. (Application range expanded) Auto Alliance (Thailand) Co., Ltd.
2007	TS 16949 (ISO 9001 Sector certificate)	Changan Ford Mazda Automobile Co., Ltd. (now Changan Mazda Automobile Co., Ltd.), Changan Ford Mazda Engine Co., Ltd. (now Changan Mazda Engine Co., Ltd.)
2015	ISO 9001	Mazda de Mexico Vehicle Operation, Mazda Powertrain Manufacturing (Thailand) Co., Ltd.
2016	ISO 9001:2015	Mazda Sollers Manufacturing Rus LLC
2018	ISO 9001:2015	Mazda Motor Corporation: Head Office, Hiroshima Plant and Hofu Plant, Mazda de Mexico Vehicle Operation, Auto Alliance (Thailand) Co., Ltd.
	IATF 16949:2016 (ISO 9001 Sector certificate)	Changan Mazda Automobile Co., Ltd., Changan Ford Mazda Engine Co., Ltd. (now Changan Mazda Engine Co., Ltd.)

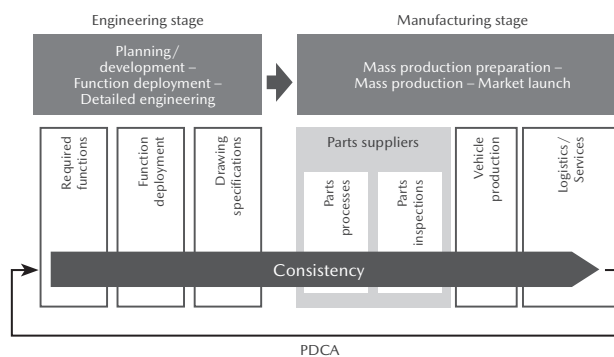
Establishing Consistent Quality, from Planning to Production

To satisfy the diverse needs of customers and offer greater trust, joy and excitement, Mazda is engaged in establishing a consistent quality level to be assured at all stages from planning/development to the delivery of products to customers.

| Establishing Stable Quality

Not only to improve the performance of products but also to enhance the quality of new technologies to respond to regulations and electrification, Mazda is committed to “process assurance.” Process assurance is the approach of ensuring a consistent quality level at all stages from engineering (planning, product development) to manufacturing (purchasing, vehicle production, logistics, after-sales services). Based on the correct understanding of customer needs and expectations, the important elements necessary to ensure each function and performance are identified. The Company has established a system to maintain and manage them in every stage from engineering to manufacturing. Furthermore, to allow customers feel the joy of driving through its products, Mazda identifies the functions and performance that embody the joy of driving for each stage from before getting in the car to after starting driving, so as to enhance consistency in establishing quality.

Consistent Process Assurance Based on Major Characteristics



| Monotsukuri Innovation

Looking five to ten years into the future, Mazda has implemented Monotsukuri Innovation for efficiently developing and manufacturing products. Shared development methods and manufacturing processes are made possible by using bundled product planning for models to be introduced in the future, spanning market segments and model classes.

Optimized structures for each function are shared across all car lines and laterally spread to each car line based on bundled product planning. A flexible production system is used to produce products engineered based on a common architecture concept in a highly efficient and flexible manner. Mazda is aiming to raise operational efficiency by building a flexible production process that can handle changes in volumes and can quickly introduce new models with a minimum of investment.

Through Monotsukuri Innovation, the Company's products since the CX-5, launched in 2012, and Skyactiv Technology have achieved the efficiency improvement in terms of both product development and manufacturing facility investment as well as significant improvements in vehicle costs.

Through design based on common architecture under Monotsukuri Innovation, Mazda is able to promptly apply the latest technologies and designs to all of its products. In new-generation technology development, the Company is working to enhance the efficiency of development processes through bundled planning and computer modeling-based development.

*1 M-QMS: Stands for Mazda Quality Management System

*2 ISO: Stands for International Organization for Standardization. ISO 9001 is a set of international standards for quality management and assurance.

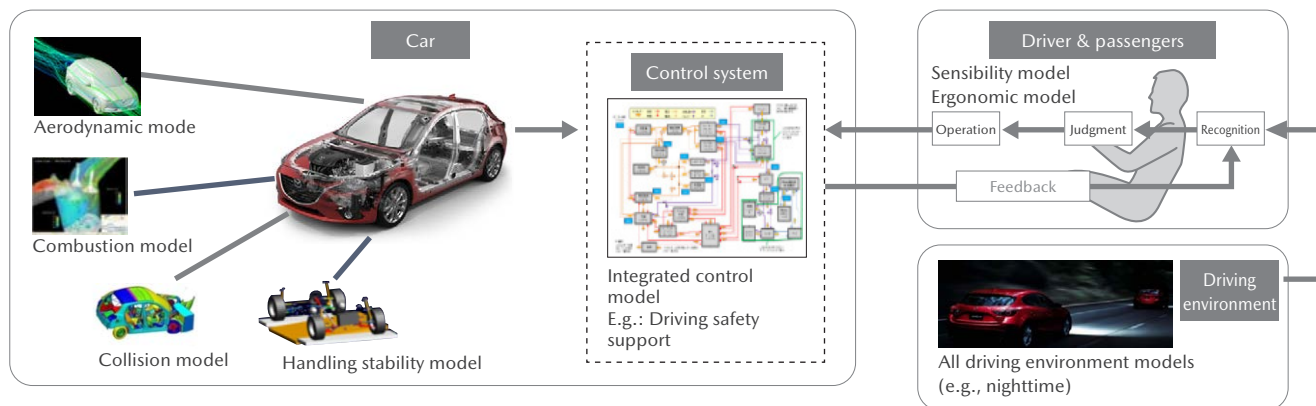
Model-Based Development (MBD)

Cars are being called on to provide increasingly advanced and diverse functions, while vehicle architecture and control systems are becoming more and more complex. Model-based development, which uses computers to efficiently replicate development processes, is essential to keep developing complex systems quickly and with limited resources. Model-based development involves creating computer models of the vehicle, control systems, drivers, passengers, driving environments and other development subjects, and conducting development via thorough computer simulation. It is an efficient method of optimization. By carrying out model-based powertrain and vehicle development through simulations from design to vehicle evaluation, Mazda strives to reduce the number of prototype parts and actual unit verification, in

order to develop complex, highly sophisticated technologies and products with minimum resources while also ensuring quality. Mazda believes that to further promote model-based development, universities working on cutting-edge technologies, automobile manufacturers and suppliers that cooperate in manufacturing must concretize the SURIAWASE 2.0 concept (P85), which seeks to enhance development efficiency by using virtual models across the engineering chain. To that end, Mazda is taking an active role in activities by the Japan Automotive Model-Based Engineering center (JAMBE). To spread the SURIAWASE 2.0 concept (P92) throughout the automobile industry nationwide, Mazda is engaged in joint activities with OEM companies and suppliers.

Model-Based Development

A technique to develop outstanding products by modeling (quantifying) and connecting all four elements of (1) the car, (2) control systems, (3) the driver & passengers, and (4) the environment without using an actual vehicle



TOPICS

Mazda receives an award from the Minister of Education, Culture, Sports, Science and Technology in 2023

In April 2023, Mazda received the Award for Science and Technology (Development Category) of the 2023 Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology for its development of rust-prevention evaluation technology. This year was the first time Mazda received a commendation in three years, and the eighth time overall.

The technology that earned this award is a way to establish consistent quality in all processes, from planning to production, and was developed to revolutionize the rust-prevention development process. It rates the rust-prevention capabilities of painted components using an electrochemical method, which enables the required functions to be quantified and as a result can make technical development more efficient. This helps to make Model-Based Development (MBD)*¹ possible. Another advantage is that by using computer modeling, manufacturers can predict quality defects and aggregate big data. While this technology was developed for vehicles, it was recognized by the ministry due to expectations for its application in a wide range of other fields, including transport, electrical appliances, factories, civil engineering, and housing.

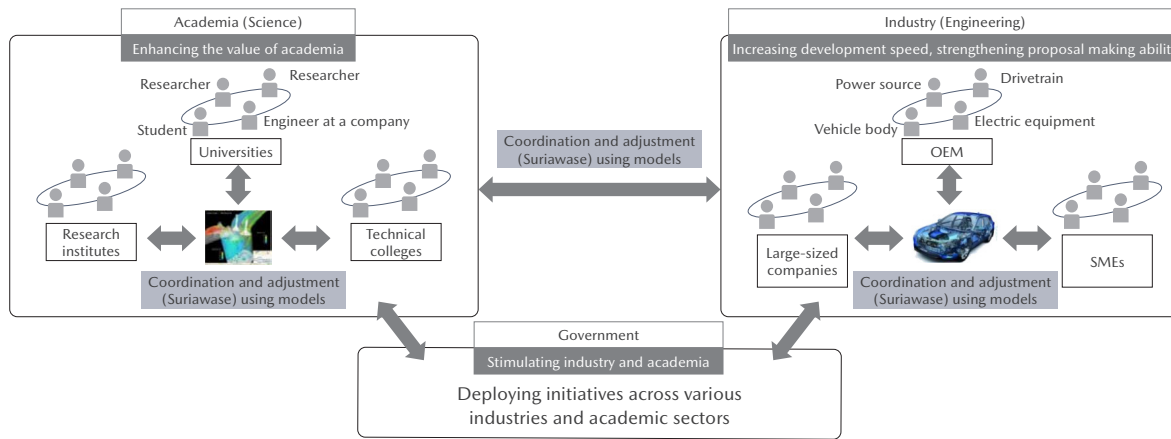
*¹ An efficient method of optimization that involves creating computer models of vehicles, control systems, drivers, passengers, driving environments and other development subjects, and conducting development via thorough computer simulation

[▶ Commendation for Science and Technology in 2023 from the Minister of Education, Culture, Sports, Science and Technology \(Japanese only\)](#)

What is Advanced Matching Development SURIAWASE 2.0?

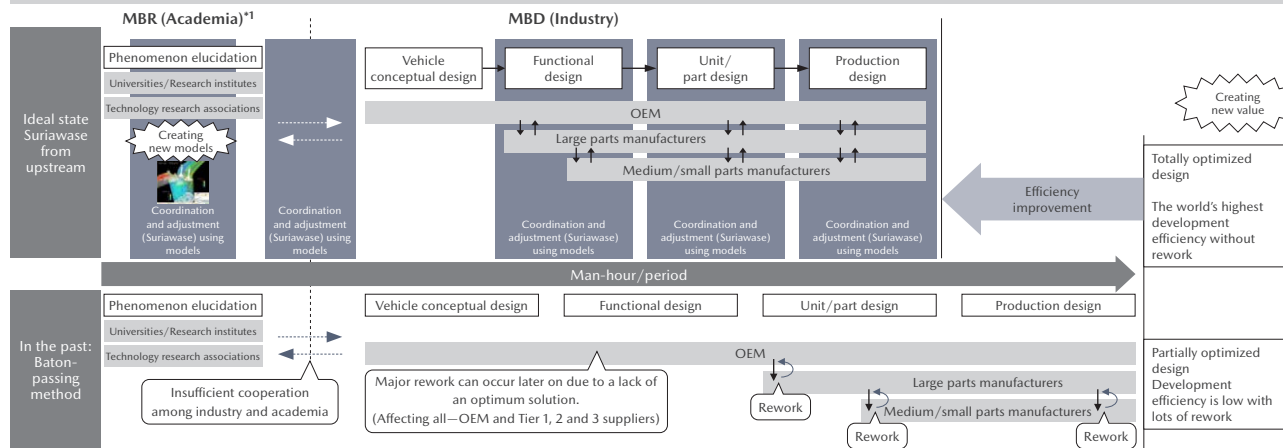
Created based on the SURIAWASE 2.0 concept presented in the materials prepared by the Ministry of Economy, Trade and Industry of Japan in 2017

SURIAWASE 2.0 is an initiative to enable academia and businesses (parts manufacturers and OEMs of all sizes) to share digital models across the board, linking academic research with development of parts, systems and vehicles, thereby allowing both sides to coordinate and make adjustments (Suriawase in Japanese) digitally from the initial stages of development, without using physical machines. This approach makes it possible to create the most-advanced development community in the mobility sector, able to carry optimal and high-grade monozukuri (engineering and manufacturing) efficiently and without rework.



Goal: Concretize SURIAWASE 2.0

Achieve the most efficient development processes in the world and create new value by innovating the research, development and production processes



*1 Model-Based Research: An approach that applies model-based concepts to research

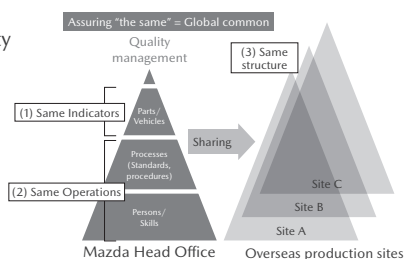
Referred to the October 2022 issue of "Introduction to JAMBE"

Global Quality Assurance

To ensure the same quality on a global scale, Mazda has adopted the “global common” concept, under which overseas production sites establish the same quality by employing the same indicators, the same operations, and the same structures as those of the Mazda Head Office.

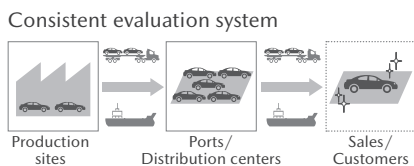
With the aim of achieving and maintaining the same quality into the future, the roles and responsibilities of the Mazda Head Office and overseas production sites have been clarified for management. As part of its efforts to secure the same quality on a global basis, Mazda works to establish common indicators of quality achievements and processes (standards and procedures) to be shared when conducting quality control of purchased parts or quality evaluation of finished vehicles. At the same time, initiatives are under way to develop human resources who can properly operate these processes. As part of its global quality assurance efforts, in cooperation with Mazda North American Operations, Mazda has developed a quality assurance system for Mazda Toyota Manufacturing, U.S.A., Inc. (MTM) in the United States. Under this system, Mazda commenced mass production of a new model in 2022.

Initiative for Global Quality Assurance



Quality Assurance after Shipment

To ensure that the high quality at factory shipment is maintained until delivery to customers around the world, Mazda has introduced the same quality evaluation indicators to be applied, from production plants to distributors and dealers, with the aim of delivering products maintaining high quality to customers around the world under a consistent evaluation system.



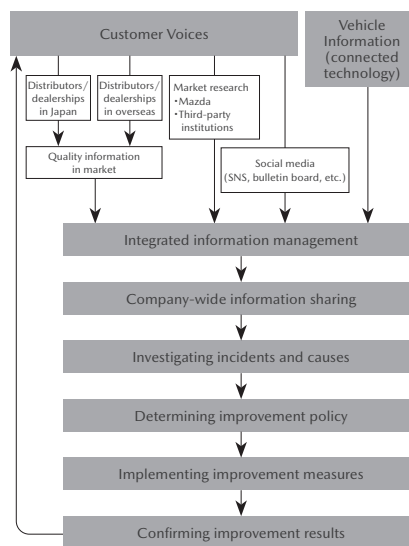
Early Detection and Early Solution of Market Problems

Mazda strives to offer an enriched car ownership experience, in which customers can feel satisfied with the car and realize the value of the product. While respecting each vehicle as a certain customer’s “one-and-only,” the Company endeavors to ensure stable and speedy quality improvement and enhance the quality of present and future products.

Comprehensive and Speedy Quality Improvement

To enable early detection and early solution of market problems, Mazda has established a system for unified management of all items of quality information. Such information is gathered from distributors and dealerships in Japan and overseas and by employing the results of surveys by external institutions and conducting the Company’s own market research. Under the system, the collected information is shared company-wide in real time. By using the system and closely monitoring daily progress, Mazda investigates quality related incidents and their causes, determines and implements improvement measures, and confirms the results. In

Quality Improvement System



this manner, Mazda works to achieve comprehensive and speedy improvement.

The Company also carries out quality improvements, capitalizing on the vehicle information collected through the utilization of connectivity technologies, in addition to conventional initiatives based on customer input.

<Examples of Surveys/Analyses>

- Gathering customer voices through Mazda-unique market survey
- Market surveys conducted by third parties
- Analysis of customer voices on social media
- Analysis of vehicle information obtained through connected technologies

Corporate Activities with Highest Priority on Customer Safety and Comfort

Mazda prioritizes safety and comfort of vehicles above all. Under a strict quality assurance system, Mazda conducts inspections on conformity with laws and regulations of each country and on functions to be used by customers, with a view to manufacturing vehicles that customers feel safe using.

This quality assurance system is maintained and managed by the development, production and quality divisions auditing each other from independent standpoints.

Recall Procedures (Overview)*1

- Registration with authorities in each jurisdiction, according to the laws and regulations of each country and region
- Disclosure to customers via direct mail, telephone, and other methods, and explanations at dealerships
- Disclosure of information on recalls on the Mazda Official Website

Number of recalls in FY March 2023: Japan (P121)

*1 Recall procedures may vary among countries/regions.

Quality Assurance That Covers Every Process up to Use by the Customer: Developing Personnel That Thoroughly Understand Customers, and Can Think and Act in Accordance with the Belief That Everything Starts with the Customer

To provide customers with satisfaction through an enriching car ownership experience, Mazda has to gain a deeper understanding of the ways in which customers use their cars and the value they expect. Mazda values customer voices all over the globe as its greatest asset. The Company is working to store this feedback in knowledge databases, and to reflect it in product planning, development, and elsewhere. Moreover, through activities such as those to educate about or raise awareness of quality, Mazda strives to continue developing personnel who think of customers as their first priority and think and act accordingly.

<Understanding Customers>

Activities to Turn Customer Voices into Knowledge

Customer voices from all over the globe are fed into a knowledge database, Mazda is working toward vehicle development that reflect these quality criteria and optimization of product quality standards.

Sharing Past Cases

Mazda has undertaken an initiative to share lessons learned from past cases through exhibits of actual defective products and videos. This program is intended to encourage employees to think about past issues as issues concerning themselves and to improve their attitudes and behavior. Since its launch in FY March 2019, a total of 27,000 employees have experienced this initiative.



Employees share past cases

<Think from the Customer's Perspective>

Quality Awareness-Raising Activities

Mazda holds quality meetings on a regular basis. At these meetings, top management communicate their commitment to compliance and quality in their own words to all employees. This provides opportunities for individual employees to reflect on and think about their work, thereby enhancing their compliance and quality awareness.

Quality Education

For the purpose of developing human resources capable of proactively finding/solving problems from a customer viewpoint and working for continuous improvement, quality control education is provided for employees. Quality education courses taught by internal instructors are offered, and employees take appropriate courses when their job type or management level changes.

Group-wide Quality Education Courses

	Course	Objective (FY March 2023)
1	Quality education program for freshmen	To understand basic quality control concepts (customer-oriented attitude, continuous improvement efforts)
2	Quality education by level	To understand quality management approaches tailored to different management levels or job roles
3	Quality management methods course	To become capable of applying and practically implementing specialized quality management techniques

<Behavior That Puts the Customer First>

QC (Quality Control) Circle Activities

Mazda promotes QC circle activities to encourage members of each workplace to find and solve problems by themselves. QC circle activities, which have been implemented for over 60 years as key activities for the company, have evolved into global activities, being conducted not only inside Mazda but also at its suppliers and dealerships. The All-Mazda QC Circle Competition held



FY March 2023 All-Mazda QC Circle Competition President's Award
Tool & Die Production
Department Speed Circle

every year at the Head Office in Hiroshima is now participated in by QC circles of Japanese dealerships and overseas sites such as those in China, Thailand, and Mexico; it is taking root as a truly global initiative.

Results of Quality Improvement Initiatives

Mazda's initiatives to improve quality have been highly praised worldwide.

FY March 2023 Results

Country	Name of the Study	Vehicle Type and Rankings ¹	Name of Company
Japan	2022 IQS ¹	4th of 14 brands	J. D. Power
		Mazda3: 3rd among mid-size vehicles	
	2022 APEAL ²	CX-5: 3rd among mid-size SUVs	
		CX-3: 3rd among compact SUVs	

¹ The J.D. Power Japan 2022 Initial Quality StudySM (IQS) is based on responses from around 20,000 purchasers of new cars. The study was carried out between May and June 2022.

² The J.D. Power 2022 Japan Automotive Performance Execution and Layout (APEAL) StudySM, is based on responses from around 20,000 purchasers of new cars. The study was fielded between May and June 2022.

Earth, People, and Society

EXPLORING PARTNERSHIPS FOR “CO-CREATION WITH OTHERS”

To ensure that Mazda will continue to thrive and grow, we must cherish and co-create Mazda’s uniqueness together with everyone involved with it. While enhancing alliances with existing partners, Mazda will continue to explore new partnerships—even outside the auto industry.

Open Innovation

Mazda has promoted collaboration with companies, universities and government authorities, aiming to efficiently resolve business issues by obtaining new knowledge from outside the Company and to achieve the sustainable growth of society and businesses (open innovation).

The business environment in which companies operate is becoming increasingly competitive due to stricter environmental and safety regulations, new competitors from other industries, and diversification of the mobility business. Through open innovation, the Company will achieve the growth of the Mazda Group and contribute to society, thereby fulfilling the Corporate Vision.*1

Objectives of Open Innovation

- [Achieve the growth of the Mazda Group]
 - Improve engineering capabilities, improve the brand value, and increase R&D efficiency
- [Contribution to society]
 - Achieve a sustainable society, advance monozukuri or product development and manufacturing (share knowledge and skills), and enhance regional empowerment

Inter-Company Collaboration


Mazda has been promoting inter-company collaboration with other automakers and suppliers, etc., to enhance their manufacturing and engineering capabilities and create synergies.

Collaboration with Partners Who Work with Mazda

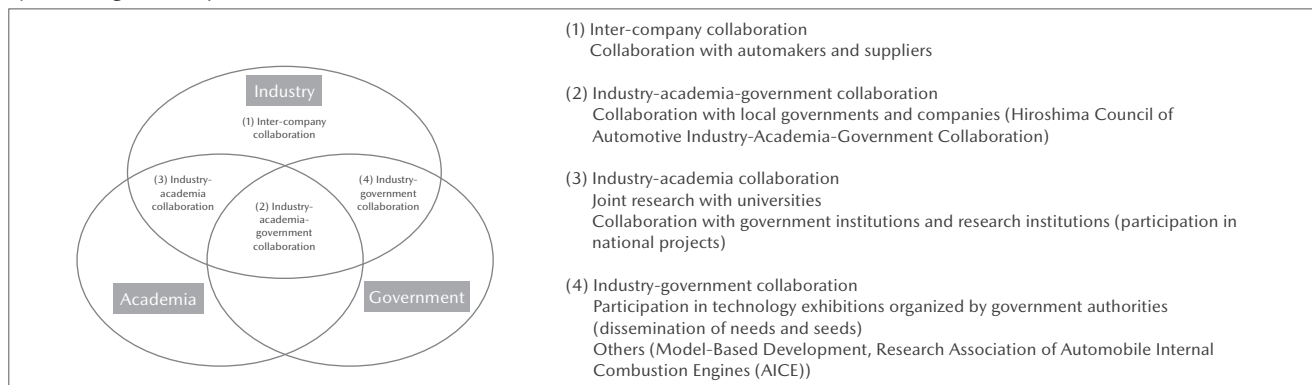
While working hard together with its partners to realize our shared dreams, the Company wants to enable them to feel proud of their connection with Mazda, and emotionally attached to the brand. This will turn Mazda into the brand it wants it to be, connected to all stakeholders, including customers, by the strongest of bonds. On the basis of mutual trust with Toyota Motor Corporation and various other companies, the Company plans to promote active collaboration.

[Collaboration Examples]

- March 2019: Participated in D-Call Net*2
- June 2019: Concluded a capital and business partnership agreement with MONET Technologies Inc.*3
- April 2021: Reached an agreement to jointly develop technical specifications for next-generation vehicle communications devices and to promote the common use of communications systems*4
- September 2021: Participated in the Japan Automotive Model-Based Engineering center (JAMBE)*5
- November 2021: Participated in the Carbon Neutral Electricity Promotion Subcommittee in the Chugoku Region*6

 For information on technologies for carbon-neutral fuels (P17)

System Diagram of Open Innovation



*1 https://www.mazda.com/globalassets/en/assets/sustainability/policy/corporate_vision_e.pdf

*2 An advanced automatic collision notification system that uses vehicle connectivity technology

*3 A company that works to create an environment to promote MaaS (Mobility-as-a-Service), aiming to encourage the widespread use of next-generation mobility services and to resolve Japan’s social mobility issues.
The MONET shareholder structure is as follows: SoftBank Corp., Toyota Motor Corporation, Hino Motors, Ltd., Honda Motor Co., Ltd., Isuzu Motors Limited, Suzuki Motor Corporation, Subaru Corporation, Daihatsu Motor Co., Ltd., and Mazda Motor Corporation.

*4 An agreement between Suzuki Motor Corporation, Subaru Corporation, Daihatsu Motor Co., Ltd., Toyota Motor Corporation, and Mazda Motor Corporation that the five companies will jointly develop and share safer and more convenient connected services with the aim of providing such services as early as possible.

*5 An organization aimed at spreading Model-Based Development (MBD) technology widely to the automobile industry nationwide. It was established in order to create the most-advanced development community in the mobility sector, with capabilities to carry optimal and high-grade monozukuri efficiently and without rework.

*6 Set up as one of the special subcommittees under the Chugoku Region Carbon Neutrality Promotion Council, established by the Chugoku Economic Federation. The subcommittee carries out discussions to expand the supply and demand of carbon-neutral electricity in the Chugoku Region.

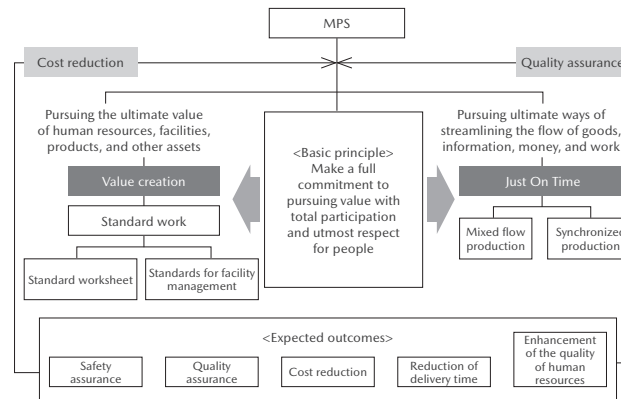
Implementation of the Autonomy Development Program That Supports the Autonomous Growth of Local Suppliers

Mazda has conducted the Autonomy Development program aimed at promoting the autonomous growth of local suppliers since 2019. This program was created for local suppliers based on the approach adopted in the Global Manufacturing Network (GMN), which has been promoted since 2013 to enable each production site in Japan and overseas to autonomously carry out high-quality and highly efficient production activities that improve the Mazda brand value and to learn from each other at the same time. The program is designed to enhance human resources development as the key to the autonomous growth of local suppliers, for which the Jiba Achieve Best Cost (J-ABC) program as a foregoer was not clearly intended. In the Autonomy Development program, promoters are assigned to play a leading role in promoting understanding of the approach in the MPS through top management training and promoter training. Local suppliers are encouraged to create a system to develop human resources through practical project work toward the company-wide operation of the system. Launched at three model suppliers in August 2019, the program is being conducted at a total of 22 suppliers (as of March 2023), with sixteen Mazda Production System (MPS) Master Trainers appointed from seven of those suppliers to lead other supervisors toward full in-house implementation of the program.

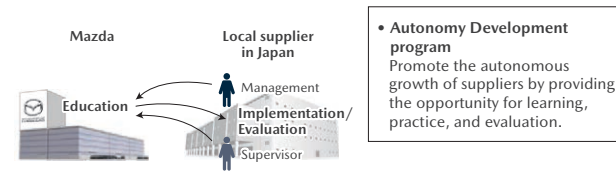
Vision to Promote MPS



MPS Flow Chart



Program Developed for Local Suppliers



Training Program	Outline	Period of Training
(1) Top management training	MPS training Lectures and workshops	56 hours in seven days
(2) Promoter training		
(3) Management training	MPS training Lectures, workshops and site visits	80 hours in ten days
(4) Supervisor training	Practical project work at suppliers	About one year of practice

Implementation of the Autonomy Development Program at Overseas Production Sites and Their Local Suppliers

In the course of transition to the Autonomy Development program in Japan, the Company has adopted the Global Manufacturing Network (GMN) at overseas production sites toward the autonomous growth of local suppliers. The five overseas production sites including AutoAlliance (Thailand) Co., Ltd. (AAT), Mazda Powertrain Manufacturing (Thailand) Co., Ltd. (MPMT), Changan Mazda Automobile Co., Ltd. (CMA), Changan Mazda Engine Co., Ltd. (CME), and Mazda de Mexico Vehicle Operation (MMVO), engage in activities with 18 local suppliers in total as of March 2023. A total of 19 members from 18 suppliers have been appointed as MPS Master Trainers.

Industry-Academia-Government Collaboration

Mazda, in establishing the Industry-Academia-Government Collaboration Secretariat, has promoted collaboration with local companies, universities and government authorities. Through collaboration among government, academia and industry, the Company has contributed to the local community in terms of developing new creative technologies and nurturing human resources capable of bringing about innovation.

Hiroshima Council of Automotive Industry-Academia-Government Collaboration (Hirojiren)*1

As a company which has its research & development and production facilities mainly in Hiroshima Prefecture, Mazda believes that cooperation with local business and industry is very important. Under this belief, Mazda is collaborating with the Chugoku Bureau of Economy, Trade and Industry, Hiroshima Prefecture, Hiroshima City, Hiroshima Industrial Promotion Organization, and Hiroshima University to support local automobile-related companies and promote innovation and the vitalization of the region. Toward achieving the 2030 Industry-Academia-Government Collaboration Vision established in 2015, various activities have been conducted, such as creating new frameworks to support local businesses, investigating next-generation automotive societies, and raising awareness in society. Following its selection for a subsidy under the Cabinet Office's Project for Revitalization of Local Universities and Regional Industries*2 for FY March 2019, Mazda was chosen in FY March 2024 for additional support to further expand upon its original activities and established the Digital Monozukuri Education Research Center at Hiroshima University. Mazda has been conducting R&D activities related to innovative materials technology, data-driven control technology, smart inspection monitoring, and smart battery/air-conditioning systems. Mazda will continue to accelerate activities with a view to the social implementation of development technologies in the future.

Major Initiatives

	Initiative	Details and results
Assisting elementary schools in providing programming education	Assisting local elementary schools in offering hands-on programming classes by following a curriculum designed under the leadership of Hirojiren and using videos and car-shaped robots (providing a series of educational materials, offering preparatory training to teachers, and assisting in teaching practical skill classes)	Provided support for programming education at elementary schools, which has become compulsory in Japan since FY March 2021, as an initiative to foster the next generation of innovators by assisting elementary schools in Hiroshima Prefecture in offering programming classes following a curriculum focused on the theme “Let’s think about the future of our lives and cars.” Created and provided learning videos on issues faced by automotive society and efforts to solve them, gave programming classes using crash-free car-shaped robots, and offered preparatory practical skill training to teachers working at the participating schools (with the participation of 960 students at 15 schools).
Co-creation and technology exchange with suppliers	① Co-creation activities with local companies ② Industry-academia collaboration activities ③ Administrative organs collaboration activities	① EV technical surveys and next-generation vehicle technical research, including into heat management, NVH, and weight reductions ② Training technical and digital staff ③ Investigation into government support for regional companies
Efforts for the spread and expansion of next-generation liquid fuel	① Demonstration testing of next-generation biofuels ② Studies on micro algae ③ Personnel training	① Continued testing, which started in 2020, into the use of the next-generation biofuel Susteo, made of used edible oil and micro algae by Euglena Co., Ltd., in some public and Mazda-owned vehicles. In 2022, started the use of Susteo for buses to transport players of soccer clubs Sanfrece Hiroshima and Sanfrece Hiroshima Regina to their home games, expanding the initiative in the region across different industries. ② In order to realize mass production of fuels that cannot be covered only by used edible oil, Mazda has been promoting studies on micro algae culture with the support of the Japanese government in collaboration with partners, including the Institute of Microalgal Technology, Japan (IMAT), Hiroshima University, and Tokyo Institute of Technology, which established a research base on Osaki Kamijima Island. ③ Through the Next-generation Liquid Fuel Symposium, lectures at Yamaguchi University and Hiroshima Shudo University, and presentation briefings at Hiroshima University's Homecoming Day or at carbon-neutrality-related seminars, Mazda is expanding its efforts to raise awareness toward achieving a carbon-neutral society.
Research and development of power source for vehicles	Fundamental research to support power source Model-Based Development (MBD)*1	① Expansion of research from internal combustion engines to EV devices such as batteries and motors, to support MBD. ② Exchange of research results and sharing of information at regional events and university lectures, to promote understanding of multi-solutions as a realistic approach to carbon neutrality.
Research and development in KANSEI (sensitivity) field	① Research and development of KANSEI (sensitivity) technology and basic research on sensitivity in collaboration with Hiroshima University ② Joint research on sensitivities with local suppliers ③ Overall coordination of sensitivity activities by relevant local groups	① Establishment and rolling out of opportunities for local suppliers to take part in activities about technologies and tools to visualize physiology and behavior for human modeling (completed). ② Implementation of joint research on sensitivities in line with plans. · Lectures and study seminars at Mazda for a shared understanding of human and vehicle modeling · Joint experiments using real vehicles to narrow down “sensitivity axes” · Creation of hypotheses for seven sensitivity axes based on the results of experiments · Taking the sense of space as a representative axis, carrying out of pre-hypothesis trials using static experiments ③ Social contribution through Hiroshima's Council for the Promotion of Innovation with KANSEI. The Applied KANSEI Café on Zoom event was held seven times, with guest lecturers from Mazda and Hiroshima University
Human resources development in Model-Based Development (MBD)*1 field	Aiming to enhance the research & development capabilities of local companies, opening basic courses for the development of human resources with MBD/CAE abilities	MBD/CAE training courses were planned and organized for all manufacturing companies, including both auto suppliers and non-automobile industries, in collaboration with the Hiroshima Digital Innovation Center. In the almost eight years since 2016, a cumulative total of 5,696 individuals participated in the training (as of May 2023). Of these training courses, the MBD process training course was certified as a Course on IT-Skill Training to Meet the Era of the Fourth Industrial Revolution by the Ministry of Economy, Trade and Industry.

*1 Model-Based Development: Development process employing simulation technologies.

The 2030 Industry-Academia-Government Collaboration Vision Upheld by Hirojiren

- Transform Hiroshima into a hub that attracts people seeking innovative automotive technologies and dynamic car culture, and a place that continually produces technologies that amaze the world.
- Industry, government and education sectors work together to nurture human resources capable of innovation across all generations, and enliven the region through monozukuri (product development and manufacturing).
- Develop Hiroshima's unique Industry-Academia-Government Collaboration into a leading model for “regional empowerment” in Japan, serving also as a benchmark for the rest of the world.

*1 A council that promotes industry-academia-government collaboration. Motivated by the strong hope and enthusiasm for encouraging the manufacturing industry in Hiroshima, its member organizations have voluntarily joined Hiroshima Council of Automotive Industry-Academia-Government Collaboration, to consider what manufacturing ought to be and to leverage innovation that will lead to industrial development.

*2 The Hiroshima Prefecture Special Committee to Promote the Project for Revitalization of Local Universities and Regional Industries was set up. Chairperson: Hidehiko Yuzaki, Governor of Hiroshima Prefecture; Project manager: Kiyotaka Shobuda, Representative Director and Chairman of the Board of Mazda Motor Corporation

Industry-Academia Collaboration




Mazda has a system to efficiently offer advanced training through collaboration with educational institutions such as universities and research institutions.

Participating in World-Leading National Projects and Joint Studies

Mazda participates in world-leading national projects and joint studies with external research institutions, with the aim of solving social problems facing the automobile industry.

Collaboration with Universities

Through enhancing collaboration with universities in various fields, Mazda aims to solve a broader range of issues from a wider perspective, thereby contributing to society.

Relevant government institutions/organizations	Project name	Outline
Ministry of Economy, Trade and Industry/New Energy and Industrial Technology Development Organization/Innovative Structural Materials Association	 Development of Innovative New Structural Materials Technology (Japanese only)	Research and development on structural materials, bonding technology, etc., to fundamentally reduce the weight of automobiles and other transportation equipment, for the purpose of reducing CO ₂ emissions
Ministry of Economy, Trade and Industry/New Energy and Industrial Technology Development Organization/Thermal Management Materials and Technology Research Association	 Research and development on innovative technology to utilize unused thermal energy (Japanese only)	Research on technology to make use unused energy* ¹ released as thermal energy into the atmosphere
Ministry of Economy, Trade and Industry/New Energy and Industrial Technology Development Organization/Green Innovation Fund Projects Coordination Office	 Green Innovation Fund Projects/Development of Next-Generation Batteries and Next-Generation Motors (Japanese only)	In addition to improving the performance and reducing costs of storage batteries and motor systems, efforts will be made to improve performance and save resources from the material level and to put advanced recycling technologies into practical use.

*¹ In Japan, refers to the energy consumed in the living environment, industry, and transportation fields and released as unused heat energy into the atmosphere

University	Collaboration outline	Measures and activities
	Next-generation automotive technology joint research course (since April 2015) Mazda has set up joint research courses with the university to find solutions to long-term technological issues and to develop human resources to implement the solutions	The following facilities have been established one by one and joint researches are ongoing: internal combustion engine laboratory, aerodynamics laboratory, advanced materials laboratory, algae energy creation laboratory, and the model-based development laboratory. Industry-academia collaboration activities have been promoted to enable Hiroshima to lead Japan in monozukuri (product development and manufacturing) through human resources development and research and development.
Hiroshima University	Comprehensive collaboration agreement (since February 2011) Through collaboration in broad areas, from technologies related to research and development and production to social science fields such as planning, management, and marketing, proactively conducting joint research. Regional empowerment and open innovation Mazda contributes to regional empowerment and human resources development of the Chugoku region and Hiroshima Prefecture, and to SDGs through collaboration with Hiroshima University and local communities and participation in national projects, etc.	Proactively conducted joint research, from exploring research themes to finding solutions. Also invested in human resources via internships. Participated in the Co-Creation Consortiums in the Material Model-Based Research Division and the Data-Driven Smart System Division of the Digital Monozukuri Education Research Center. (P90)
Hiroshima City University	Mazda and Hiroshima City University Faculty of Arts Co-Creation Seminar (since May 2017) Set up a co-creation seminar with the university, aiming to develop human resources who are capable of creating new manufacturing for a new era, and make Hiroshima a place to generate human resources for manufacturing that Hiroshima can boast to the world.	Implemented a co-creation seminar to conduct modeling activities with the theme “Train Station: A Beautiful Spot to Sit” to redevelop Hiroshima Station (FY March 2023).
Kyushu University	Establishment of a joint research department (since August 2017) Mazda has set up a joint research department with the university to find solutions to long-term technological issues and to develop human resources to implement the solutions. Inter-organizational collaboration regarding next-generation automotive technologies (since May 2011) Mazda has been working together with the university to reinforce research and development projects and to encourage academic research and education activities.	Opened the Mazda Next-generation Energy Storage Joint Research Department (in August 2017). Delivered a special lecture on introduction to automotive science in the Department of Automotive Science of the Graduate School of Integrated Frontier Sciences (in May 2022).
Kindai University	Agreement concerning comprehensive research collaboration (since December 2012) Cooperating in bolstering cutting-edge research development and in strengthening the technological capabilities of local industries.	The Research Collaboration Promotion Committee held meetings to discuss the progress of joint research projects and specific measures to strengthen cooperation.
University of Hyogo	Concluded an agreement on joint research using Spring-8, a large synchrotron radiation facility (May 2016) Cooperating in the development of innovative materials and product development technologies using radiation analysis techniques.	Set up an experimental station dedicated to research into applications of advanced analytical techniques.
Tokyo Institute of Technology	Mazda's participation in Tokyo Tech's Super Smart Society Promotion Consortium (from October 2018) In the consortium, industry, government and academia collaborate in accelerating the development of both element technologies and human resources to realize a super smart society (Society 5.0). Mazda has contributed to providing cross-sectional education about the most advanced sciences and technologies, including quantum science, in order to integrate cyber- and physical-space technologies to connect people, the earth, and society. Comprehensive Security Protection Agreement (from October 2016) The agreement defines comprehensive security protection rules that apply to technical consultation and other occasions. Lecture on automotive technology Along with Toyota Motor Corporation and Honda Motor Co., Ltd., Mazda has been commissioned to teach automotive technology courses at the School of Engineering every three years on a rotating basis.	Participated in matching workshops for exchange of information about research seeds and companies' needs, held twice a year, and promoted the arrangement of new technical research and internships. Conducting joint research into practical application for research seeds for AI and technologies to predict people's movements (from FY March 2021) Simplified the procedure for security protection during technical consultation Structured and implemented the lecture based on the concept of Mazda's monozukuri

Industry-Government Collaboration

Mazda efficiently promotes cutting-edge joint research, etc., through collaboration with government authorities.

Basic and Applied Research on Technologies for Internal Combustion Engines and Cleaner Exhaust Emissions

Mazda participates in the Research Association of Automobile Internal Combustion Engines (AICE),*¹ a joint research organization dealing with new fields in the Japanese automobile industry. AICE was established on April 1, 2014, with the support of the Ministry of Economy, Trade and Industry to enable automobile manufacturers to conduct basic and applied studies jointly with universities and research institutions on themes common to automobile manufacturers, and to use the research results to accelerate their in-house development activities. AICE is currently conducting basic research under a research scenario aimed at achieving carbon neutrality by 2050. Taking advantage of its participation in AICE, Mazda is promoting its development of technologies for internal combustion engines and cleaner exhaust gases, with a view to achieving improved fuel economy and reduced exhaust emissions. Beginning in April 2019, the Company has expanded the scope of its development efforts to include mechanical resistance reduction and heat management technologies.

Promotion of Model Distribution in the Automotive Industry

Mazda has participated in the Study Group for Ideal Approaches to Model Utilization in the Automobile Industry organized by the Ministry of Economy, Trade and Industry since its launch in November 2015. The Company works on initiatives with other automakers and parts manufacturers to spread Model-Based Development (MBD), a development technique to achieve the advanced development and performance assessment process for automobiles through virtual simulation.

In April 2018, the Company agreed on the Enrichment of SURIAWASE 2.0*² for the Automobile Industry (an industry-academia-government joint strategy project policy), and announced that the Company would continue with the initiatives to enrich MBD and harmonization areas, etc. In addition, Mazda formulated the guidelines for smoothly promoting model distribution between companies, based on the results of activities implemented by the study group thus far. In December 2018, the study group and ProSTEP iVip,*³ an international standardization organization, jointly announced these guidelines to the world, as international rules originating from Japan. This study group concluded its activities in March 2021, and in order to carry on the results of the study, ten companies became operating members, and the Japan Automotive Model-Based Engineering center (JAMBE) was established in September 2021 to spread MBD technology widely to the automobile industry nationwide. Since then, the number of participating companies has grown to 133 (as of March 2023) and in March 2023 the organization was made a general incorporated association. Mazda is also participating as one of the operating member companies, and it takes full advantage of the accumulated knowledge of virtual simulation and unique MBD that have been refined through Mazda Digital Innovation (MDI) to contribute to activities for increasing the global competitiveness of the Japanese automotive industry.



Photo from the launch of JAMBE as a general incorporated association

*1 Membership of which comprises nine Japanese vehicle manufacturers and two other organizations (as of the end of March 2023)

*2 An initiative to enhance the harmonization of development processes by taking advantage of an MBD process that uses virtual simulations instead of physical machines across entire supply chains in Japan. A Study Group for Ideal Approaches to Model Utilization in the Automobile Industry was organized in November 2015 by the Ministry of Economy, Trade and Industry, to further enhance the international competitiveness of the automotive industry.

*3 An international standardization organization based in Germany. Its membership comprises 185 companies, primarily automakers in Europe, the United States and Japan, as well as airlines and software companies. ProSTEP iVip works to develop and promote international rules regarding CAD and MBD.