

# Summary of the White Paper on Monodzukuri 2007

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Ministry of Economy, Trade and Industry (METI)  
Ministry of Health, Labour and Welfare (MHLW)  
Ministry of Education, Culture, Sports, Science  
and Technology (MEXT)

## Chapter 1. Challenges and prospects for Japan's *monodzukuri* - Toward strengthening supply chains and improving the reliability of *monodzukuri* -

### (The Japanese manufacturing industry's general business conditions)

- Japan's manufacturing industry expanding production and increased the number of production sites as the economy bottomed out and started to recover in 2002. However, uncertainty over its future is increasing due to soaring resource prices and other factors (Chart 1-1).

### (The current state and challenges of manufacturers' supply chains expanding throughout Asia)

- Japanese manufacturers are expanding production in Asia, driven by intensifying global competition and the growth of Asia. As their supply chains (chains of companies involved in a sequence of activities from raw material procurement through to the delivery of products to consumers [customers]) expand throughout Asia, exports of intermediary goods from Japan to other parts of Asia have increased (Chart 1-2).

- Fundamental industries for *monodzukuri* are also exposed to competition with Asian contenders. Since this competition is expected to intensify (Chart 1-3), consolidating their management foundations is essential from the viewpoint of strengthening the competitiveness of Japan's entire *monodzukuri* industry.

This requires (1) promoting fair subcontracting practices in order to create an environment in which basic *monodzukuri* industries can secure reasonable profits (Chart 1-4), (2) fostering innovations that meet the needs of downstream companies, and (3) consolidating the management foundations of Japanese companies by allowing them to absorb the vitality of growing Asian economies through exports and overseas operations.

- Expansion of supply chains and improvement of efficiency (e.g., reduced inventories) increase competitiveness.

However, an important perspective is to strengthen the entire supply chain, in consideration of

(1) Impacts of potential disruption in supplies in the event of disaster and other reason (Chart 1-5);

(2) Risk of leakage of technical information from customers (e.g., suppliers).

(3) Importance of securing quality human resources and preserving skills and expertise for the company itself as well as its suppliers.

Companies should counter the risk of disruption in supplies in a way that does not hinder their competitiveness and that takes account of the degree of its potential impact and their own supply chains' strengths and weaknesses (Chart 1-6).

### (Restoring confidence in *monodzukuri*)

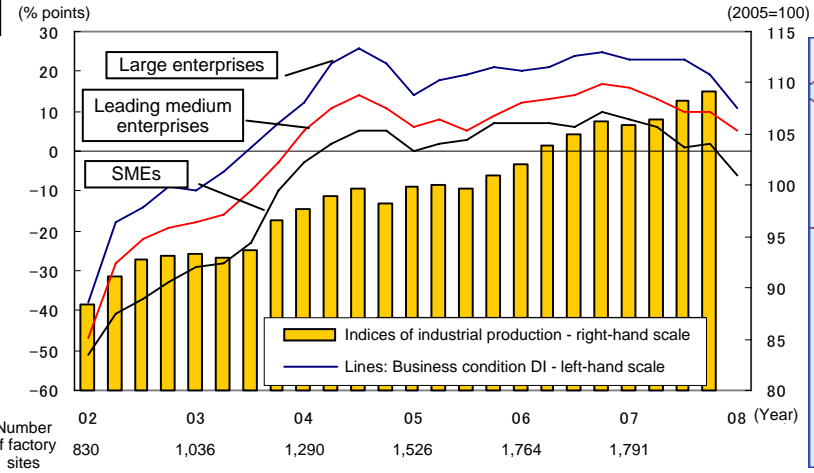
- When companies are involved in intensifying competition and increasingly advanced and complex *monodzukuri* processes, recent occurrence of product safety problems and fraud cases one after another has undermined consumer confidence in *monodzukuri* (Chart 1-7).

Companies, including not only top management but even a worker, should renew their awareness of the value of safety and confidence and step up efforts to improve their design philosophy, organization and so on. On the other hand, to address the fear that counterfeit goods produced mainly in Asia may cause safety problems and harm confidence in Japanese *monodzukuri*, measures to combat counterfeiting are needed.

### (Adapting to resource and environmental constraints)

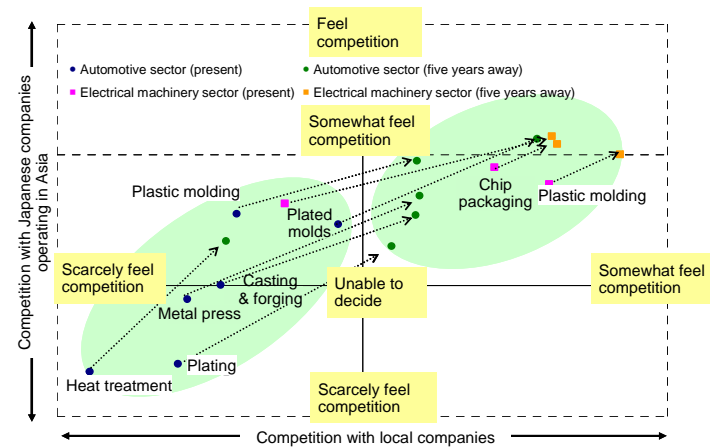
- Resource and environmental constraints have become so severe that they affect the business viability of manufacturers. Relevant efforts should be accelerated. Rare metals are an important factor of industrial competitiveness. Their supply is also at risk due to soaring prices and a shift in the resource policy of producing countries. Japan urgently needs to make efforts to strengthen relationships with resource-producing countries and propel a shift to *monodzukuri* that uses less rare metal (e.g., by promoting the 3Rs and developing alternative resources or materials). This should be done by furthering individual companies' efforts as well as fostering collaborative efforts (e.g., resource savings through coordinated efforts by companies constituting a supply chain) (Chart 1-8). Japan's manufacturing industry should also take advantage of its strength in the environmental field to enhance its international competitiveness.

[Chart 1-1 Japanese manufacturing industry's production and business condition DI]



Note: The business condition DI is calculated by the percentage of companies having answered the business conditions are "favorable" minus that of companies having answered "unfavorable."  
Source: "Indices of Industrial Production" and "Factory Construction Site Trend Survey," METI  
"Short-Term Economic Survey of Enterprises in Japan," Bank of Japan

[Chart 1-3 Japanese basic industries' competition with Asian counterparts]



Source: Survey by METI (Dec. 2007)

[Chart 1-5 Disruption in supplies from parts suppliers and its impact]



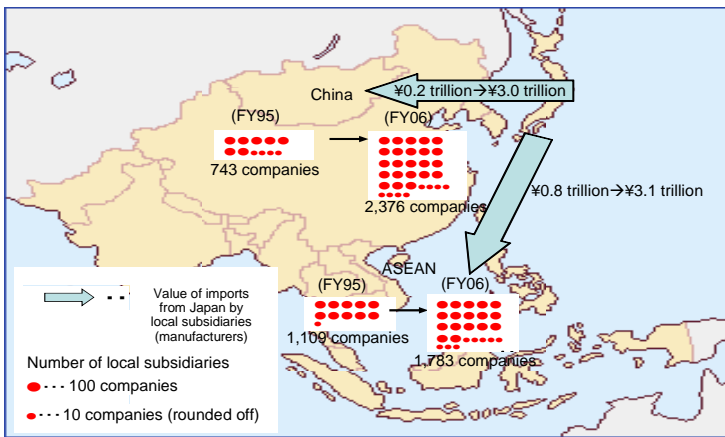
Source: Prepared based on news reports

[Chart 1-7 Impacts of the occurrence of product-related accidents]

	Company A	Company B
Product	Battery	Insect spray
Units subject to recall	46 million units	3.25 million bottles
Annual production	62 million units	3.25 million bottles
Note	¥10-20 billion spent for free replacement	¥1.95 billion extraordinary loss posted

Source: Prepared by METI based on news reports

[Chart 1-2 Value of procurement from Japan by Asian subsidiaries of Japanese manufacturers (FY95 vs. FY06)]



Source: "Basic Survey of Overseas Business Activities," METI

[Chart 1-4 Improvements under the Guidelines for the Promotion of Fair Subcontracting Practices (machine parts and tooling industries)]

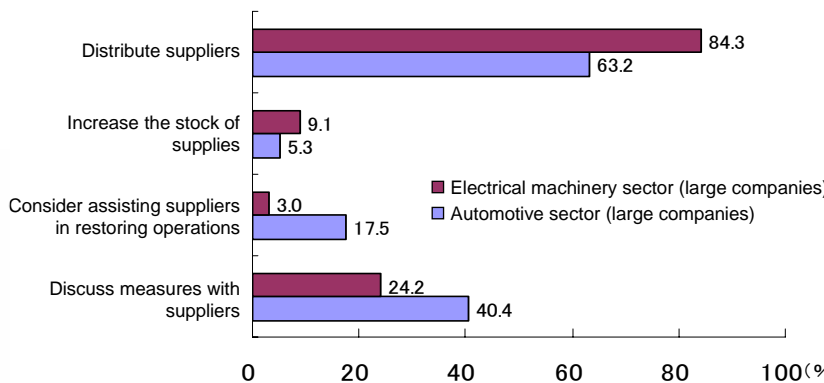
#### Case 1. Appropriate reflection of increases in raw material prices into purchase prices

To cope with soaring raw materials prices, the frequency of the price meeting, which used to be once in six months, has been changed through discussion so that the supplier can have an opportunity to propose new prices once in a quarter if raw material prices change beyond the specified range.

#### Case 2. Improvement of the mold storage cost problem

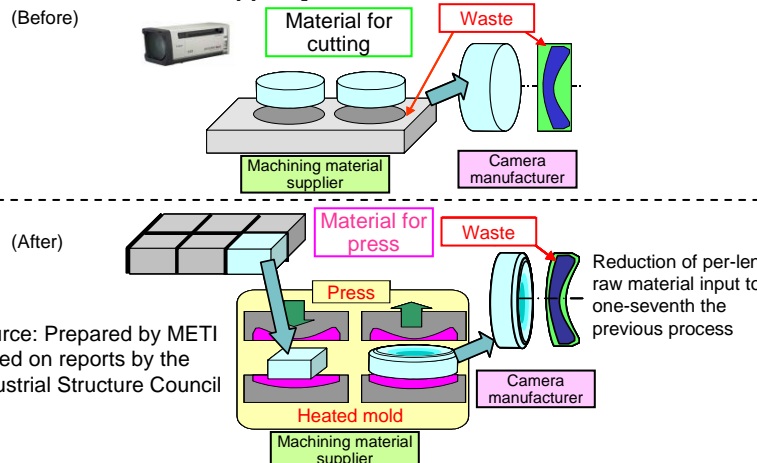
The supplier has become able to scrap unused molds by filing a request for removal to the customer once in six months and receiving approval and removal costs from the customer.

[Chart 1-6 Measures to counter the risk of disruption in supplies]



Source: "FY 2007 Survey of the Japanese Manufacturing Industry's Structure for International Division of Work in the Globalizing Economy," Japan Machinery Federation

[Chart 1-8 A joint initiative to save resources in the TV camera lens production process by a camera manufacturer and its materials supplier]



Source: Prepared by METI based on reports by the Industrial Structure Council



# Chapter 2. Human resource development for consolidating the base for monodzukuri

## (Current state of employment and labour of *monodzukuri*-related industry workers)

The workforce in the manufacturing industry has been increasing since the second half of 2005. Workforce shortages remain high (Chart 2-1). The number of new graduates hired is still at a low level, although having increased. The stability of these new employees poses a problem, especially in small and medium enterprises.

## (Diversifying work style in the *monodzukuri* industry)

A major management challenge for *monodzukuri* organizations is to give high priority to “high quality and accuracy,” “short delivery times,” and “price competitiveness” in order to succeed in international competition. To meet this challenge, companies are changing and enhancing their human resources requirements. For example, engineers are expected to have broad expertise as well as creativity that enables improvements in production systems, while technicians are expected to be not only highly skilled and versatile but also capable of making proposals and executing them on the shop floor so that streamlined operations and high value creation can be fostered, thereby improving the company’s financial standing (Chart 2-2).

A recent trend is the diversification of working styles across all kinds of *monodzukuri* jobs. For example, the number of dispatched workers has increased as companies try to cope with variations in demand, competition with Asian rivals and price competition, but there has been no significant change in the percentage of regular employees and that of non-regular employees (including part-timers) in the entire workforce (Chart 2-3).

Amid this diversification of work styles, non-regular employees and outsourced workers undertake not only jobs that require only minimum experience, but also jobs that involve qualification or skills that take several or more years to acquire. Nowadays, non-regular workers are engaged even in areas that call for expertise and adaptability to change and that determine the quality of the product.

## (Challenges and keys to developing human resources)

For developing regular employees’ job skills, nearly 80% of companies provide Off-JT and about 50% of companies provide OJT based on programs in place. On the other hand, non-regular employees are given fewer opportunities to develop their job skills than are regular ones (Chart 2-4).

These fundamental challenges increase the need to

- Help regular employees to gain job experience through OJT, acquire expertise through Off-JT, and share knowledge and values through active networking with other people;
- Raise the level of education and training for non-regular workers, as well as the level of their skills, and clarify career prospects for them;
- Improve the safety and other basic training programs and the skills evaluation criteria for both regular and non-regular employees.

Shop floor staff view the effects of using non-regular workers as follows: While non-regular workers bring benefits such as allowing the shop floor to adapt to variations in workload and enabling regular employees to focus on more sophisticated jobs, they increase the personnel management workload and raises the need to take action to ensure accumulation and preservation of know-how (Chart 2-5).

The establishment of a personnel management system should be promoted with a view to contributing to consolidating the base for the entire range and diversity of *monodzukuri* activities.

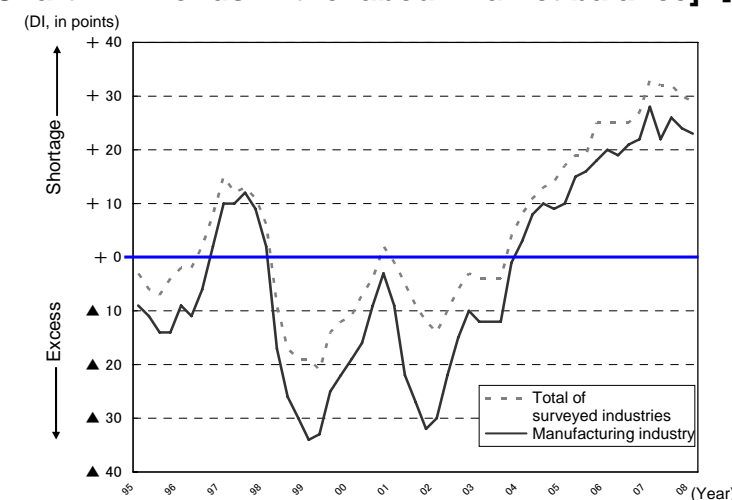
## (Promotion of policies for human resource development)

To nurture technicians with advanced skills, the government will support programs for current employees, including the provision of vocational training and the means to preserve corporate know-how and skills.

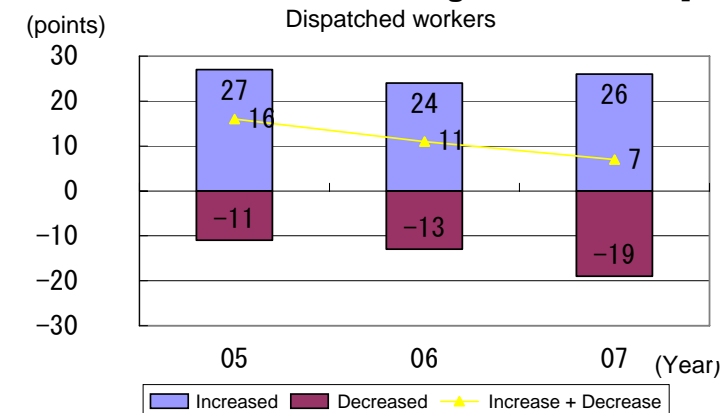
To develop practical human resources that can play central roles on the shop floor, the “practical human resource development system,” a vocational training program that combines internships and lectures, will be promoted. For “freeters” (job hoppers), the job card system will be promoted in order to help them find worthwhile jobs by increasing job opportunities for them as regular employees. This system will also be used in *monodzukuri* industries.

Based on the results of the International Skills Festival for All, Japan 2007, the government will further the improvement of infrastructure to make Japan a *monodzukuri*-based nation (Chart 2-6).

[Chart 2-1 Trends in the labour market balance]

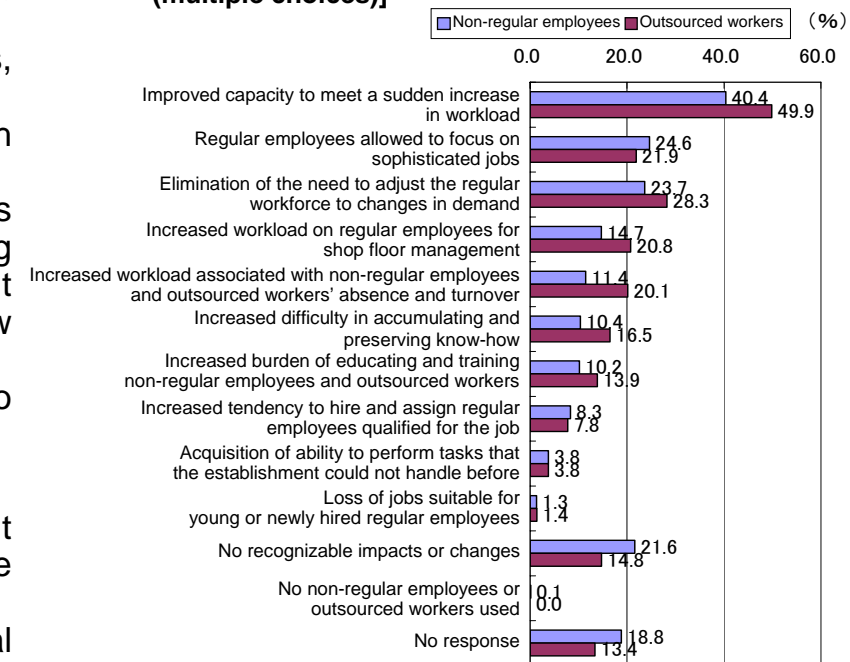


[Chart 2-3 The percentage of establishments where dispatched workers increased or decreased, among manufacturers using such workers]



Source: “Survey on Labour Economy Trends,” MHLW

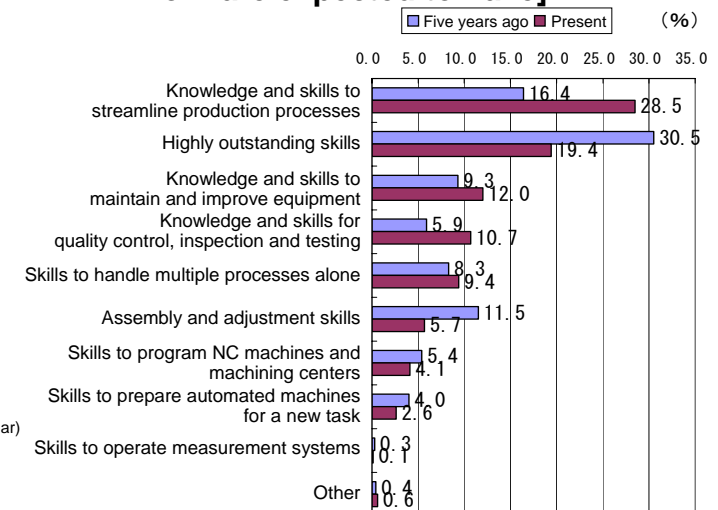
[Chart 2-5 Effects on the shop floor caused by the use of non-regular employees and outsourced workers (multiple choices)]



Source: “Survey on Human Resource Acquisition and Development in the Manufacturing Industry,” 2008, Japan Institute for Labour Policy and Training

Note: Non-regular employees – Employees directly hired by the company operating the given establishment but not on a permanent basis. They can be part-timers, or full-time contracted employees (e.g. temporary factory workers and contract employees).  
Outsourced workers – Workers who are not directly hired by the company operating the given establishment but working there. They can be dispatched workers or workers hired by the contractors.

[Chart 2-2 The most important knowledge and skills that regular employees for technical work are expected to have]



Source: “Survey on Human Resource Acquisition and Development in the Manufacturing Industry,” 2008, Japan Institute for Labour Policy and Training

[Chart 2-4 Manufacturers providing Off-JT and program-based OJT]



Source: “Basic Survey of Skills Development,” 2008, MHLW

[Chart 2-6 International Skills Festival for All, Japan 2007]



[ A Japanese competitor in a polymechanics competition ]



[ Closing ceremony ]



## Chapter 3. Promotion of education and R&D to underpin monodzukuri

### (*Monodzukuri* education at technical colleges and vocational high schools)

- For the promotion of fundamental technologies for *monodzukuri*, it is essential to develop human resources to underpin them. In particular, technical colleges and vocational high schools are educational institutions central to *monodzukuri* education provided in cooperation with industry.
- Technical colleges, which are designed to nurture practical and creative *monodzukuri* engineers, should enhance and strengthen their roles in preserving and advancing *monodzukuri* technologies and producing innovations (Chart 3-1).
- Industrial and other vocational high schools, which are aimed at nurturing the next generation's professionals who will play important roles in regional *monodzukuri* industries, should improve their hands-on vocational education programs and carry out initiatives involving long-term internship programs (the dual system) and engineers invited as instructors. There is a need to develop curricula in accordance with the characteristics of individual schools and to enhance collaboration with regional communities (Chart 3-2).

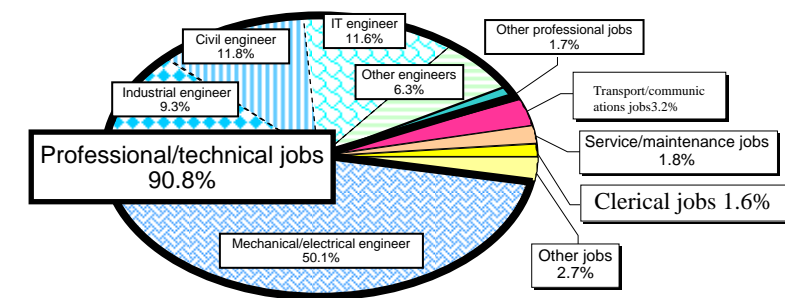
### (Development of human resources for *monodzukuri* through school education)

- The amended Fundamental Law of Education stipulates that the relationship between education and career should be stressed as a new goal of education. The new government course guidelines stipulate hands-on career education as a new requirement.
- The government has expanded education in science, technology and mathematics by assigning new staff to assist scientific observations and experiments in elementary schools and by promoting the development of high school curricula that emphasize science and mathematics.
- Elementary, junior high and high school students learn about *monodzukuri* as part of their curricula. Schools have enhanced their career education by providing students with opportunities to experience *monodzukuri* in the real world. For example, some schools take students over to local company offices and plants to learn about careers, and some junior high schools provide students with five-day or longer internship programs.
- For universities, the government promotes *monodzukuri* education in accordance with the characteristics of individual schools, for example, by supporting educational programs aimed at nurturing *monodzukuri* engineers with advanced knowledge and skills and by fostering quality, long-term internship programs jointly provided by industry and academia (Chart 3-3).
- Vocational schools are used for offering practical vocational education in cooperation with industry, while museums and universities are used for providing extensions aimed at deepening people's understanding of *monodzukuri*.  
MEXT is supporting a wide range of activities that many different organizations conduct with the aim of fostering education on *monodzukuri* (Chart 3-4).

### (Promotion of R&D to enhance Japan's industrial capacity)

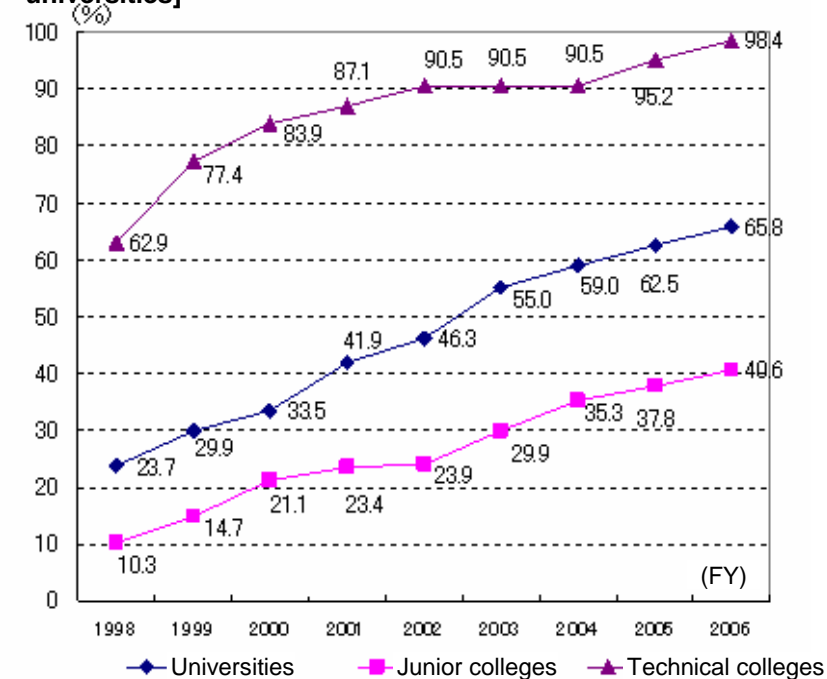
- The government is promoting R&D of fundamental technologies for *monodzukuri* based on science, with an eye toward increasing the Japanese manufacturing industry's international competitiveness and allowing Japan to lead the world in *monodzukuri* technology even with the decline in the workforce for *monodzukuri* (Chart 3-5).
- *Monodzukuri* technology comprises technology that materializes product innovation in the remaining seven fields listed in the Third Science and Technology Basic Plan. Since *monodzukuri* is inseparable from these remaining fields, initiatives to promote *monodzukuri* are in progress in coordination with these fields.
- The government is creating an environment that fosters the creation of fundamental technologies for *monodzukuri* by allowing R&D results to be returned to society. Efforts toward this include promoting joint research by universities and companies, strengthening intellectual property strategies (e.g., expanding the Intellectual Property Policy Headquarters, collaborating with TLOs), supporting the creation of university ventures, and consolidating regional innovation systems (Charts 3-6 & 3-7).

[Chart 3-1 Jobs chosen by technical college graduates, by industry]



Source: "Basic Survey on Schools 2007," MEXT

[Chart 3-3 Internship programs offered at universities]



Note: The percentages for universities, junior colleges and technical colleges refer to those that provided internships as credit courses.  
Source: Survey by MEXT

[Chart 3-2 An example of education on *monodzukuri* at vocational high schools]



Photo: Vocational high school students in hands-on training at local SMEs (Kuwana Technical High School, Mie Prefecture)

[Chart 3-4 Diverse initiatives for education on *monodzukuri*]



Photo: 8th National Creative Monodzukuri Fair for Junior High School Students (hosted by the Japan Association of Study Groups on Technical Arts and Home Economics at Junior High Schools and others)

[Chart 3-5 Examples of R&D projects on fundamental technologies for *monodzukuri*]

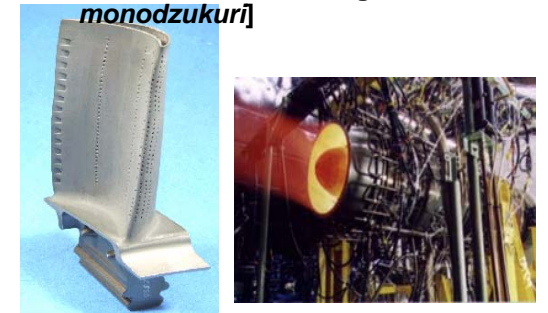
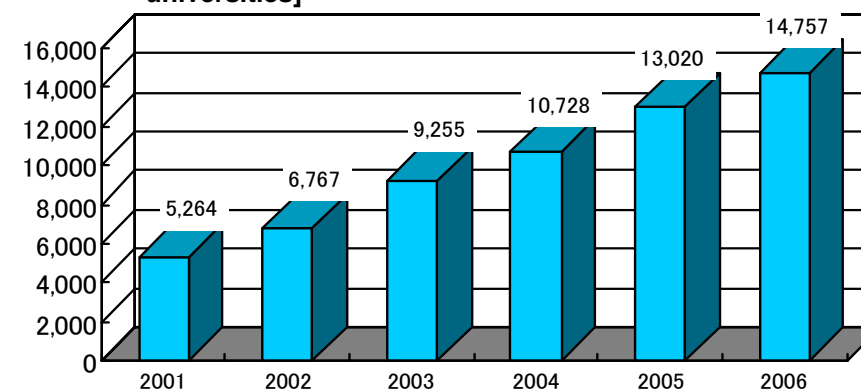


Photo: A turbine blade made of TMS-138, an ultra-high temperature resistant fourth-generation alloy, and the ground testing of a supersonic engine based on this

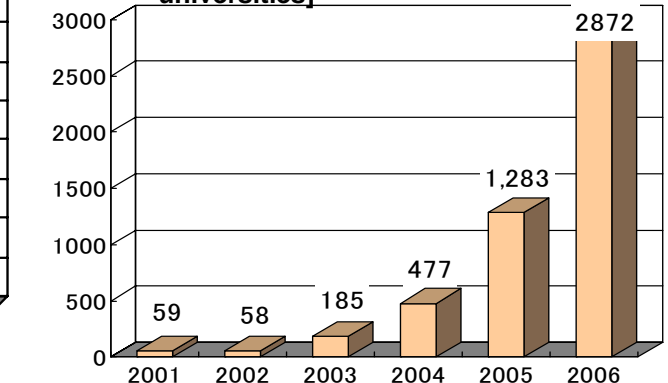
[Chart 3-6 Number of joint research projects conducted by universities]



\* The data before 2003 refer only to national universities and those in and after 2003 refer to public and private universities.

Source: Survey by MEXT

[Chart 3-7 Number of patents licensed by universities]



\* The data before 2003 refer only to national universities and those in and after 2003 refer to public and private universities.

Source: Survey by MEXT