Summary of the White Paper on Manufacturing Industries (Monodzukuri) 2010

June 2010

Ministry of Economy, Trade and Industry
Ministry of Health, Labour and Welfare
Ministry of Education, Culture, Sports, Science and Technology
Chapter 1 Status of Japanese manufacturing industries in relation to domestic and overseas economies

Section 1 Status of Japan’s manufacturing industry

(Situation surrounding Japan’s manufacturing industries: Japan’s economic conditions)

Amid the ongoing significant changes in the domestic and overseas economies following the global recession, Japan’s real GDP posted a steep negative growth of 5.0% in 2009. However, since the second quarter of 2009, real GDP has recorded positive growth, supported mainly by external demand and final consumption expenditures due to the effects of policy measures and the recovery of overseas economies. In the fourth quarter of 2009, real GDP posted a positive growth of 0.9% (annualized growth of 3.8%) according to the second preliminary data.

(Notable features of the recovery from the global recession (1) production)

Although production is recovering, its level is about 85% of the peak level. As for the trend in production during past recession and recovery phases, production increased in a broad range of business sectors after the bursting of the economic bubble in the early 1990s, and the electronics components and devices industry led production in Japan in the previous recovery. This time, the transport machinery industry is recording a remarkable production increase.

[Chart 1-1 Changes in Contributions of GDP Components to Real GDP Growth Rate]
[Chart 1-2 Components of Household Final Consumption Growth (compared with the previous quarter)]

Source: Cabinet Office “National Accounts”

[Chart 1-3 Patterns of Production Adjustments and Recovery in Manufacturing]

[Chart 1-4 Changes in Contribution to Production Recovery by Business Sector]

Remarks: For descriptive purposes, the above indexes were calculated with each economic peak as 100. *For the current recovery, February 2009 was deemed to be the trough. Source: METI “Indices of Industrial Production”
As a result of the global economic recovery led mainly by Asia and a pickup in production in the transport machinery and other industries due to progress in inventory adjustments, the transport machinery, electronic parts and devices and electrical machinery industries are leading production in various regions in Japan. The business conditions of small and medium-size enterprises (SMEs) remain severe on a region-by-region basis, although they are improving.

[Chart 1-5 Changes in Contribution to Indices of Industrial Production by Region (compared with the previous quarter)]

Source: METI and regional bureaus of economy, trade and industry, “Indices of Industrial Production”; Okinawa Prefecture, “Indices of Industrial Production”

[Chart 1-6 Business Condition DI's for SMEs (manufacturing sector) by Region]


China’s share as a destination of Japanese exports in terms of value has exceeded the shares of the United States and the EU. After the outbreak of the global recession, demand from emerging Asian economies, mainly the Chinese economy, has supported Japanese exports.

Meanwhile, the yen’s exchange rate has stayed higher than the level assumed by exporting companies because of its recent appreciation, so it should be kept in mind that the strong yen could have a significant impact on the business environment for Japan’s manufacturing industries.

[Chart 1-7 Changes in Export Destination Regions’ Shares in Value of Japanese Exports]

Shares of China and other Asian countries as the destinations of Japanese exports are growing.

Source: Ministry of Finance, “Trade Statistics”

[Chart 1-8 Changes in Export Value by Region (after the economic peak)]

Source: Ministry of Finance, “Trade Statistics”

[Chart 1-9 Changes in Exchange Rates Assumed by Exporting Companies]

Corporate earnings declined significantly due to a drop in sales caused by the global recession. Although manufacturing companies quickly dealt with the recession by reducing costs and curbing investments, interest-bearing debts increased as such efforts failed to fully cover the sales drop. The financing condition remains difficult, mainly for SMEs, although some improvement is seen.

Demand for durable goods such as automobiles and home electric appliances is recovering, supported by the effects of economic measures, while demand for materials is picking up, led mainly by exports to Asia. However, regarding the relationship between the capacity utilization ratio and capital investment, the state of excess capacity is continuing, with the recovery of industrial machinery and other capital investment lagging. Japanese manufacturing companies are investing for various purposes according to the degree of the recovery of the markets: in Japan, they are investing in order to make existing products more sophisticated, develop new products and to maintain and repair facilities, while abroad, their investments are aimed at capacity expansion.

As the capacity utilization ratio remains low, the state of excess capacity is continuing.

Remarks: The capacity utilization index is calculated with the figure for 2005 as 100 (seasonally-adjusted). The capital investment amounts are raw figures.


Change in Financial Position DI (Chart 1-11)

The financing position remains severe despite some improvement.


Change in Cash Flow and Interest-bearing Debts (Chart 1-10)

Remarks: The above figures represent four-quarter backward moving averages.


Change in Cash Flow and Interest-bearing Debts

Interest-bearing debts started to grow.

Operating cash flow
Cash flow is declining.

Operating cash flow (left axis)
Capital investment (left axis)
Cash flow (left axis)
Interest-bearing debts (right axis)

Chart 1-10 Changes in Cash Flow and Interest-bearing Debts

<table>
<thead>
<tr>
<th>Year</th>
<th>Operating cash flow</th>
<th>Capital investment</th>
<th>Cash flow</th>
<th>Interest-bearing debts</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>2006</td>
<td>110</td>
<td>110</td>
<td>110</td>
<td>110</td>
</tr>
<tr>
<td>2007</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
</tbody>
</table>

Chart 1-12 Changes in Capacity Utilization Index and Growth in Capital Investment for Manufacturing Industries

As the capacity utilization ratio remains low, the state of excess capacity is continuing.

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity utilization index</th>
<th>Capital investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>82.8</td>
<td>46.5</td>
</tr>
<tr>
<td>2006</td>
<td>83.4</td>
<td>47.5</td>
</tr>
<tr>
<td>2007</td>
<td>84.1</td>
<td>48.6</td>
</tr>
</tbody>
</table>

Chart 1-13 Projections for capital investment in Fiscal 2010 and Items for Focused Investments (compared with fiscal 2009)

- Increase for some items and decrease for others
- 43.5%
- 7.2%
- 49.3%
- 1.3%
- 2.3%
- 14.6%
- 26.0%
- 9.6%
- 19.2
- 25.6
- 29.4
- 46.5

Domestic production bases (n=1,363)
Overseas production bases (n=301)

Remarks: The figures in the lower chart are those based on replies given by firms that said they would increase investment for some items and decrease it for others in the above chart.

Source: Survey by METI (February 2010)
Amid the ongoing significant changes in the business environment, such as increased resource and environmental constraints and changes in global market shares, Japanese manufacturing industries have started to restructure business strategies ahead of full-fledged recovery of the domestic and overseas economies. They are reviewing mainly their product development and sales operations, and in order to adapt to changes, they are making increased efforts to revise the way to foster personnel and review product line-ups.

In order to better adapt to the surrounding environment and respond to the diversifying needs of the global market by taking advantage of Japan’s superiority in technological capability, Japanese manufacturing companies will need to strengthen their product development and sales/marketing powers.

Direction of business restructuring in Japanese manufacturing industries and future approaches

**Chart 1-14 Status of Review of Business Strategies and Relationship with Past Strategies**

<table>
<thead>
<tr>
<th>Review of Business Strategies</th>
<th>Not reviewing strategy 19.7%</th>
<th>Adopted slightly altered strategy 21.1%</th>
<th>Adopted partially altered strategy 51.9%</th>
<th>Adopted significantly altered strategy 7.3%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations reviewed during the past five years (n=2,047)</td>
<td></td>
<td></td>
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<tr>
<td>Operations currently under review (n=2,208)</td>
<td></td>
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</tbody>
</table>

Source: Survey by METI (February 2010)

**Chart 1-15 Status of Review of Operations**

<table>
<thead>
<tr>
<th>Review of Business Operations</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
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</thead>
<tbody>
<tr>
<td>Review of business operations</td>
<td>31.1</td>
<td>44.7</td>
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<tr>
<td>Review of product operations</td>
<td>37.4</td>
<td>45.2</td>
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<tr>
<td>Review of sales operations</td>
<td>37.5</td>
<td>68.2</td>
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<td></td>
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<tr>
<td>Review of after-sale service operations</td>
<td>13.1</td>
<td>13.2</td>
<td></td>
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<tr>
<td>Others</td>
<td>0.9</td>
<td>1.7</td>
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Source: Survey by METI (February 2010)

**Chart 1-16 Specifics of Review of Business Strategies**

<table>
<thead>
<tr>
<th>Review of Business Strategies</th>
<th>0</th>
<th>10</th>
<th>20</th>
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<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
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<tbody>
<tr>
<td>Review of business bases</td>
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<tr>
<td>Review of organizational structure of business bases</td>
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<tr>
<td>Review of personnel structure</td>
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<tr>
<td>Review of staffing composition</td>
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<td></td>
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<tr>
<td>Review of training method and programs</td>
<td></td>
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<tr>
<td>Review of status of outsourcing/entrustment/procurement</td>
<td></td>
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<tr>
<td>Review of status of capital investment</td>
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<tr>
<td>Review of status of R&amp;D</td>
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</tbody>
</table>

Source: Survey by METI (February 2010)

**Chart 1-17 Japanese Manufacturing Industries’ Current Areas of Strength and Would-Be Areas of Strength for Future Business Expansion**

<table>
<thead>
<tr>
<th>Business Function</th>
<th>Current area of strength and competitiveness (n=2,675)</th>
<th>Would-be area of strength (n=2,871)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product development</td>
<td>38.8 55.3</td>
<td>32.9 40.0</td>
</tr>
<tr>
<td>Parts/materials procurement</td>
<td>24.0 29.4</td>
<td>24.6 30.5</td>
</tr>
<tr>
<td>Production technology</td>
<td>21.9 29.4</td>
<td>24.3 30.5</td>
</tr>
<tr>
<td>Sales</td>
<td>6.5 21.9</td>
<td>22.6 30.5</td>
</tr>
<tr>
<td>Marketing</td>
<td>3.7 13.3</td>
<td>17.4 24.3</td>
</tr>
<tr>
<td>Advertising</td>
<td>18.2 33.0</td>
<td>12.2 17.4</td>
</tr>
<tr>
<td>After-sale service</td>
<td>17.0 33.0</td>
<td>12.2 17.4</td>
</tr>
<tr>
<td>Others</td>
<td>3.4 13.3</td>
<td>10.4 12.2</td>
</tr>
</tbody>
</table>

Source: Survey by METI (February 2010)

**Chart 1-18 Activities Necessary for Future Product Development**

<table>
<thead>
<tr>
<th>Activity</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
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</thead>
<tbody>
<tr>
<td>Development of more environment-friendly products</td>
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<tr>
<td>Shortening product development period/cycle</td>
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<tr>
<td>Skill improvement for existing researchers and engineers</td>
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<tr>
<td>Codevelopment/partnership with manufacturers in the same sector</td>
<td></td>
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<tr>
<td>Codevelopment/partnership with manufacturers in other sectors</td>
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<tr>
<td>Codevelopment/partnership with internal marketing division</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Codevelopment/partnership with universities/research institutions</td>
<td></td>
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<tr>
<td>Acquisition/retention of superior external research/enginers</td>
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<tr>
<td>Development of products with long life cycle</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Establishing overseas R&amp;D centers</td>
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</tr>
<tr>
<td>Codevelopment/partnership with companies outside the manufacturing sector</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Survey by METI (February 2010)
The number of people employed in manufacturing industries has been on a long-term downturn, and although the number began to recover in the first half of 2005, it has been declining again since the second half of 2007. The unemployment rate reached a record high of 5.6% in July 2009 and then gradually declined to stand at 5.0% in March 2010. The active job opening to applicant ratio dropped to a record low of 0.42 in August 2009 and then rose to 0.49 in March 2010. Despite these signs of recovery, the condition of the job market remains severe.

The number of new job offers and the active job opening to applicant ratio in the areas of production processes and labor services has recently been growing moderately.

Remarks: I to IV represent the 1st quarter to the 4th quarter. The above figures are raw numbers. Source: MIC “Labour Force Survey”

[Chart 1-19 Changes in the Number of Workers Employed, etc. in Manufacturing Industries]

[Chart 1-20 Changes in the Unemployment Rate and Active Job Opening to Applicant Ratio ]

Remarks: The above figures are seasonally adjusted. Source: MHLW “Report on Employment Service”

[Chart 1-21 Changes in the Number of Job Offers in Manufacturing Industries (October 2007=100)]

[Chart 1-22 Change in the Active Job Opening to Applicant Ratios in Production Process and Labor Services]

Remarks: The above ratios represent the figures concerning permanent jobs excluding those concerning new graduates but including those concerning part-time jobs. Not seasonally adjusted. Source: MHLW “Statistics on Job Security”
The sense of excess employment at companies that grew rapidly in the first half of 2009, particularly in the manufacturing industry, has gradually receded since then. Overtime hours worked in manufacturing industries increased after continuing to decline until March 2009, and, in January 2010, recovered to almost the same level as in October 2008.

The proportion of companies which implemented some form of employment adjustment was nearly 50% in the second quarter of 2009. In particular, the proportion of such companies reached 70% in manufacturing industries. However, it has been on the decrease since then.

The number of people covered by the employment adjustment subsidy program started to increase rapidly around the end of 2008 and still remains at a high level despite the downtrend seen since the second half of 2009.

[Chart 1-23 Changes in the D.I. of Employment Conditions]

[Chart 1-24 Changes in Overtime hours worked]

[Chart 1-25 Changes in the proportion of enterprises that implemented employment adjustment]

[Chart 1-26 Receipts of Business Closure Plans related to Employment Adjustment Subsidy (provisional)]
In order to improve the employment situation, which remains severe, the government formulated the “Emergency Package of Employment Measures” in October 2009 and the “Emergency Economic Countermeasures for Future Growth and Security” in December of the same year.

(1) Measures to maintain and create employment
   a) Easing the conditions for the subsidies for employment adjustment and for small and medium-sized enterprises for emergency employment stabilization
   b) Providing free vocational training for those who are not eligible to receive unemployment benefits, and providing training and livelihood support benefits during the training period
   c) Expanding emergency job creation programs

(2) Strengthening support for the poor and needy
   a) Implementing the One-Stop Service Day on a trial basis
   b) Deploying housing and life support advisors
   c) Expanding housing support measures

(3) Strengthening support for new graduates
   a) Doubling the number of career counselors for senior high school and college graduates.
   b) Establishing a program that provides new graduates with an opportunity for workplace experience
   c) Providing vocational training to unemployed graduates and increasing training and livelihood support benefits

[Table 1-27 Economic and Employment Measures (key points of measures related to employment support)]

<table>
<thead>
<tr>
<th>Emergency Economic Countermeasures for Future Growth and Security (adopted upon a cabinet decision on December 8, 2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easing the conditions for the subsidies for employment adjustment (7.8 billion yen)</td>
</tr>
<tr>
<td>Implementation of the “One-Stop Service Day” on a trial basis</td>
</tr>
<tr>
<td>An increase of approx. 1,250 people (from 1,250 to 2,500)</td>
</tr>
<tr>
<td>An emergency increase of 310 people (from 68 to 928) in the number of career counselors for senior high school and college graduates (250 million yen)</td>
</tr>
<tr>
<td>Program to create jobs in priority business sectors (150 billion yen)</td>
</tr>
<tr>
<td>Establishment of employment and life security systems</td>
</tr>
<tr>
<td>Emergency Employment Measures (October 23, 2009)</td>
</tr>
<tr>
<td>Easing the conditions for the subsidies for employment adjustment, etc.</td>
</tr>
<tr>
<td>Implementation of the “One-Stop Service Day” on a trial basis</td>
</tr>
<tr>
<td>Development of new training programs and securing new training providers in the emergency human resource development project (Provisional maximum number of trainees: 122,800 people in fiscal 2009; 80,000 people the goal for trainee acceptance in fiscal 2009: 100,000 people; the number of training applicant: 120,000 people the goal for application in fiscal 2009: 80,000 people)</td>
</tr>
<tr>
<td>Notes: The mark “◎” represents a new measure and the mark “○” represents a measure which was enhanced or regarding which the conditions were eased.</td>
</tr>
</tbody>
</table>
Although there are signs of an economic recovery amid the uncertainty over the global economy, the employment situation in Japan remains severe. Recognizing this situation as an opportunity to secure human resources, some small and medium-size enterprises (SMEs) are eager to employ workers in order to enhance their competitiveness.

METI, together with the Ministry of Agriculture, Forestry and Fisheries, the Ministry of Health, Labour and Welfare and various relevant organizations, selected 1,417 companies that are eager to employ workers and devote efforts to human resource development, and it published “1,400 Job-Creating Companies” in February 2009. This was distributed to schools, Hello Work facilities and job cafes across Japan and made available on METI’s website. As a result of a follow-up survey concerning “1,400 Job-Creating Companies” that was conducted to grasp the employment status after the publication of the book, it has been found that 637 companies, mainly SMEs, hired about 7,000 people (of which 2,000 people were mid-career workers), and that many companies are planning to hire new employees.

Moreover, METI compiled a new list of “job-creating companies” in order to support the job search activity of new graduates, who are expected to continue facing a severe job market condition, in accordance with the Emergency Economic Countermeasures for Future Growth and Security, which was drawn up in December 2009. In January 2010, METI launched a website intended to demonstrate the attractive features of 1,443 job-creating companies so as to help to resolve the mismatch between the needs of job seekers and employing companies.

METI also organizes bus tours to non-metropolitan regions to provide job seekers and students from across the country with an opportunity to discover the attraction of industries where there is such a mismatch, including monodzukuri, agriculture and nursing care sectors, as a way to promote employment. The bus tours, which include one- to five-day courses, offer various programs, enabling participants to see the workplace first-hand and talk with top managers, for example. In some cases, tour participants were employed by the companies they visited, indicating that the tours provide a meeting place for job seekers and companies eager to employ workers.

Website: http://www.meti.go.jp/policy/mono_info_service/mono/sokeizai/kigyogaiyosyu.html

[Chart: “Job-Creating Companies” (published in January 2010) and the Results of a Follow-Up Survey concerning “1,400 Job-Creating Companies” (published in February 2009)]

[Employment Status at the 1,400 Job-Creating Companies (published in February 2009) (by business sector)]
Section 1 Japanese manufacturing industries face structural changes in the global economy

In the wake of the Lehman shock, changes in the business environment for the Japanese manufacturing industries have become evident. For example, while markets in developed nations have matured, those in emerging countries have grown. In addition, manufacturing operations in Asia have expanded and the region’s industrial infrastructures have become more advanced. Moreover, changes in market needs in response to increased resource and environmental constraints have become evident. In light of these global structural changes, the Japanese manufacturing industries will need to restructure their business strategies to create added value.

A look at the situation of the global market shows that markets in developed nations have matured, while emerging countries have increased their share of the global GDP as a result of population growth and rising income. Emerging countries have also increased their presence as both production bases and markets.

[Chart 2-1 Changes in Nominal GDP Share of World’s Major Regions]

Remarks: On a US$ basis. Major Asian nations/regions excluding China refer to ASEAN, India, South Korea and Taiwan. Source: IMF, “World Economic Outlook Database, April 2010”

Japan’s dependency on exports is not high compared with other major nations. The margin of the increase in Japanese exports has been similar to the margin of the growth of the economies of developed nations, which means that Japan has not fully taken advantage of business opportunities in growth markets around the world.

[Chart 2-2 International Comparison of Export Dependency]

Source: Statistics compiled by OECD

Among major countries, Japan has the second lowest export dependency

[Chart 2-3 Growth of Asian Emerging Countries and Increase in Value of Exports by Major Countries]

Japanese exports have not fully benefited from an expansion of Asian emerging markets.

Source: IMF, “World Economic Outlook”
While global consumption of energy and resources is expanding as a result of the economic growth of emerging countries, a variety of resources are unevenly distributed around the world, a fact that has increased resource and environmental constraints. The increase in such constraints and the aging of society changes market needs. The Japanese manufacturing industries will need to restructure business strategies in order to create added value in the global market in light of these changes in the business environment.

[Chart 2-4 Changes in the Competitiveness of Manufacturing Industries of Countries and Regions (changes in the share of total value added by manufacturing industries of countries and regions)]

[Chart 2-5 Changes in the Export Specialization Index of Intermediate Goods]

While the shares of Japan and the United States declined, those of Asian emerging countries grew.

Remarks: Export specialization index = (Exports of intermediate goods − imports) / (exports of intermediate goods + imports)
Source: Research Institute of Economy, Trade and Industry, “RIETI-TID 2009”

[Chart 2-6 Increase in Environmental Constraints]

[Changes in Oil Consumption Volume]

[Changes in Steel Consumption Volume]

Source: Statistics by World Steel Association
In order to create added value in the global market, the Japanese manufacturing industries will have to appropriately allocate business resources and make effective use of them. It is important to maintain and strengthen Japan’s competitiveness as a supply base of sophisticated parts and products and make efforts to create added value based on technology, such as by diversifying the profit source of monodzukuri, while capturing demand in new growth markets.

(Progress in the division of labor in the Japanese manufacturing industries)

The number of local subsidiaries of Japanese companies (in the manufacturing sector) is declining in the United States and Europe, whereas the number of such local subsidiaries is continuing to increase in emerging countries in Asia and other regions. The number of sales bases is also increasing in emerging countries in Asia and other regions, indicating the growing importance of those regions as markets.

[Chart 2-7 Changes in Number of Japanese Companies’ Local Subsidiaries (manufacturing sector)]

Although region-by-region sales of Japanese companies’ local subsidiaries generally recorded declines in fiscal 2008, the margin of the sales decline for Asia was small, suggesting that emerging countries in Asia are replacing the United States and Europe as the main driver of the earnings of the Japanese manufacturing industries.

[Chart 2-9 Sales of local subsidiaries (manufacturing sector) by Region]

Remarks: The above figures represent the numbers of companies whose Japanese headquarters are manufacturers and overseas business bases are retailers, wholesalers or service providers.
In emerging markets, companies with poor business performance tend to introduce high-end products without identifying the key customer segment. In order to gain market share, it is necessary to clarify which class of customers to target. Concerning other points, there is not any significant difference between companies with poor performance and those with good performance. In short, the important thing to do is to provide value and functions suited to the needs of the local market with regard to each product.

| Table 2-11 Key Customer Bases in Emerging Countries and Level of Introduced Products |

### Companies with good business performance (n=97)

<table>
<thead>
<tr>
<th>Product level</th>
<th>Key consumer segment</th>
<th>High-end (High performance/quality)</th>
<th>Medium-range</th>
<th>Low-end (Low performance/quality)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wealthy class</td>
<td>14%</td>
<td>9%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Middle class</td>
<td>21%</td>
<td>34%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Low-income class</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>8%</td>
<td>13%</td>
<td>0%</td>
</tr>
</tbody>
</table>

### Companies with poor business performance (n=63)

<table>
<thead>
<tr>
<th>Product level</th>
<th>Key consumer segment</th>
<th>High-end (High performance/quality)</th>
<th>Medium-range</th>
<th>Low-end (Low performance/quality)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wealthy class</td>
<td>8%</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Middle class</td>
<td>22%</td>
<td>32%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Low-income class</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>17%</td>
<td>14%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Remarks: “Companies with good (poor) business performance”: Companies whose sales share or operating profit amount, or both, increased (decreased) at an annual rate of more than 5% over the past three years.

Source: Survey by METI (January 2010)

(Competitors in emerging markets and their strengths)

Many competitors in emerging markets are Chinese, South Korean or Taiwanese companies. They are superior in product pricing according to the functions and specifications of the product as well as the local needs and in reducing costs. The Japanese manufacturing industries will need to act nimbly in the development of products while taking account of the strategies of competitors. Meanwhile, Japanese companies continue to compete with U.S. and European companies to a certain extent, and competition is still ongoing between Japanese companies, too.

[Chart 2-12 Greatest Competitors in Emerging Countries]

<table>
<thead>
<tr>
<th>Category</th>
<th>Total (n=896)</th>
<th>Foods (n=31)</th>
<th>Plastic products (n=32)</th>
<th>Metal products (n=77)</th>
<th>Electric machinery (n=91)</th>
<th>General machinery (n=146)</th>
<th>Chemical products (n=83)</th>
<th>Transport machinery (n=65)</th>
<th>Precision machinery (n=90)</th>
<th>Electronic components/devices (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>26%</td>
<td>16%</td>
<td>22%</td>
<td>32%</td>
<td>25%</td>
<td>23%</td>
<td>29%</td>
<td>22%</td>
<td>13%</td>
<td>33%</td>
</tr>
<tr>
<td>20%</td>
<td>18%</td>
<td>23%</td>
<td>16%</td>
<td>21%</td>
<td>15%</td>
<td>19%</td>
<td>19%</td>
<td>14%</td>
<td>4%</td>
<td>40%</td>
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<tr>
<td>40%</td>
<td>6%</td>
<td>10%</td>
<td>13%</td>
<td>6%</td>
<td>8%</td>
<td>14%</td>
<td>10%</td>
<td>8%</td>
<td>1%</td>
<td>3%</td>
</tr>
<tr>
<td>60%</td>
<td>5%</td>
<td>3%</td>
<td>9%</td>
<td>6%</td>
<td>14%</td>
<td>23%</td>
<td>14%</td>
<td>22%</td>
<td>19%</td>
<td>23%</td>
</tr>
<tr>
<td>80%</td>
<td>15%</td>
<td>10%</td>
<td>9%</td>
<td>13%</td>
<td>14%</td>
<td>29%</td>
<td>19%</td>
<td>22%</td>
<td>19%</td>
<td>23%</td>
</tr>
<tr>
<td>100%</td>
<td>29%</td>
<td>39%</td>
<td>31%</td>
<td>26%</td>
<td>29%</td>
<td>29%</td>
<td>31%</td>
<td>34%</td>
<td>34%</td>
<td>23%</td>
</tr>
</tbody>
</table>

[Chart 2-13 Competitors’ strengths in emerging countries]

- Appropriate targeting of customer market segments
- Development of products meeting local market needs
- Broad product lineup
- Introduction of products priced according to local purchasing power
- Low-cost production due to increased local procurement
- Cost reduction due to increased local production
- Broad sales network
- Superior sales channel management
- Active advertising
- Broad, high-quality service network
- Forward-looking investment led by the headquarters

Source: Survey by METI (January 2010)
Japanese companies have generally seen their presence decline amid the ongoing changes in the league table of global market players due to the industry realignment led by European companies and the growth of emerging-country companies.

**O-Steel (by crude steel production volume)**: While progress was being made in the realignment of European companies, crude steel production by Chinese and Indian companies increased.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Company (Country)</th>
<th>Production (million tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nippon Steel (Japan)</td>
<td>26.8</td>
</tr>
<tr>
<td>2</td>
<td>POSCO (South Korea)</td>
<td>23.4</td>
</tr>
<tr>
<td>3</td>
<td>British Steel (UK)</td>
<td>15.7</td>
</tr>
<tr>
<td>4</td>
<td>Usinor Sacilor (France)</td>
<td>15.5</td>
</tr>
<tr>
<td>5</td>
<td>Riva (Italy)</td>
<td>14.4</td>
</tr>
<tr>
<td>6</td>
<td>Arbed (Luxembourg)</td>
<td>12.1</td>
</tr>
<tr>
<td>7</td>
<td>USX (US)</td>
<td>12.0</td>
</tr>
<tr>
<td>8</td>
<td>NKK (Japan)</td>
<td>11.5</td>
</tr>
<tr>
<td>9</td>
<td>Kawasaki Steel (Japan)</td>
<td>11.1</td>
</tr>
<tr>
<td>10</td>
<td>Sumitomo Metals (Japan)</td>
<td>10.7</td>
</tr>
</tbody>
</table>

**O-Chemicals (by sales of the chemical division)**: While European companies realigned operations along the lines of high-value-added and commodity product businesses, Saudi and Chinese companies increased sales, mainly of commodity products.

<table>
<thead>
<tr>
<th>Year</th>
<th>Company (Country)</th>
<th>Sales ($ billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>BASF (Germany)</td>
<td>31.3</td>
</tr>
<tr>
<td>2</td>
<td>Du Pont (US)</td>
<td>27.3</td>
</tr>
<tr>
<td>3</td>
<td>Bayer (Germany)</td>
<td>20.2</td>
</tr>
<tr>
<td>4</td>
<td>Dow Chemical (US)</td>
<td>18.6</td>
</tr>
<tr>
<td>5</td>
<td>ExxonMobil (US)</td>
<td>13.8</td>
</tr>
<tr>
<td>6</td>
<td>ICI (UK)</td>
<td>13.7</td>
</tr>
<tr>
<td>7</td>
<td>Shell (UK/Netherlands)</td>
<td>12.9</td>
</tr>
<tr>
<td>8</td>
<td>AkzoNobel (Netherlands)</td>
<td>12.5</td>
</tr>
<tr>
<td>9</td>
<td>Degussa (Germany)</td>
<td>10.1</td>
</tr>
<tr>
<td>10</td>
<td>BP (UK)</td>
<td>9.4</td>
</tr>
<tr>
<td>11</td>
<td>Total (France)</td>
<td>9.3</td>
</tr>
<tr>
<td>12</td>
<td>Elf Aquitaine (France)</td>
<td>9.3</td>
</tr>
<tr>
<td>13</td>
<td>Sumitomo Chemical (Japan)</td>
<td>8.1</td>
</tr>
<tr>
<td>14</td>
<td>Huntsman (US)</td>
<td>8.0</td>
</tr>
<tr>
<td>15</td>
<td>Mitsubishi Chemical (Japan)</td>
<td>7.8</td>
</tr>
<tr>
<td>16</td>
<td>Henkel (Germany)</td>
<td>7.3</td>
</tr>
<tr>
<td>17</td>
<td>Aventis (France)</td>
<td>7.1</td>
</tr>
<tr>
<td>18</td>
<td>GE (US)</td>
<td>6.9</td>
</tr>
<tr>
<td>19</td>
<td>Solvay (Belgium)</td>
<td>6.8</td>
</tr>
<tr>
<td>20</td>
<td>Dupontine Ink and Chemicals (Japan)</td>
<td>6.7</td>
</tr>
</tbody>
</table>


Source: METI, based on Chemical & Engineering News and other materials.

**OElectrical machinery (by sales)**: As South Korean and Taiwanese companies increased their presence significantly, Japanese companies declined in the ranking list although many remained among the top 20.

<table>
<thead>
<tr>
<th>Year</th>
<th>Company (Country)</th>
<th>Sales ($ billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>General Electric (US)</td>
<td>100.5</td>
</tr>
<tr>
<td>2</td>
<td>Siemens (Germany)</td>
<td>66.0</td>
</tr>
<tr>
<td>3</td>
<td>Hitachi (Japan)</td>
<td>62.4</td>
</tr>
<tr>
<td>4</td>
<td>Matsushita Electric Industrial (Japan)</td>
<td>58.8</td>
</tr>
<tr>
<td>5</td>
<td>Sony (Japan)</td>
<td>53.2</td>
</tr>
<tr>
<td>6</td>
<td>Toshiba (Japan)</td>
<td>41.5</td>
</tr>
<tr>
<td>7</td>
<td>Royal Philips Electronics (Netherlands)</td>
<td>38.5</td>
</tr>
<tr>
<td>8</td>
<td>NEC (Japan)</td>
<td>37.2</td>
</tr>
<tr>
<td>9</td>
<td>ABB (Switzerland)</td>
<td>30.9</td>
</tr>
<tr>
<td>10</td>
<td>Lucent Technologies (US)</td>
<td>30.1</td>
</tr>
<tr>
<td>11</td>
<td>Mitsubishi Electric (Japan)</td>
<td>29.7</td>
</tr>
<tr>
<td>12</td>
<td>Motorola (US)</td>
<td>28.4</td>
</tr>
<tr>
<td>13</td>
<td>Intel (US)</td>
<td>26.3</td>
</tr>
<tr>
<td>14</td>
<td>L.M.Ericsson (Sweden)</td>
<td>23.2</td>
</tr>
<tr>
<td>15</td>
<td>Samsung Electronics (South Korea)</td>
<td>18.4</td>
</tr>
<tr>
<td>16</td>
<td>Northern Telecom (Canada)</td>
<td>17.6</td>
</tr>
<tr>
<td>17</td>
<td>Ericsson (Sweden)</td>
<td>14.8</td>
</tr>
<tr>
<td>18</td>
<td>SANYO Electric (Japan)</td>
<td>14.3</td>
</tr>
<tr>
<td>19</td>
<td>Nokia (Finland)</td>
<td>14.5</td>
</tr>
<tr>
<td>20</td>
<td>Sharp (Japan)</td>
<td>13.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Company (Country)</th>
<th>Sales ($ billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>General Electric (US)</td>
<td>152.9</td>
</tr>
<tr>
<td>2</td>
<td>Siemens (Germany)</td>
<td>91.5</td>
</tr>
<tr>
<td>3</td>
<td>Hitachi (Japan)</td>
<td>84.0</td>
</tr>
<tr>
<td>4</td>
<td>Matsushita Electric Industrial (Japan)</td>
<td>81.1</td>
</tr>
<tr>
<td>5</td>
<td>Samsung Electronics (South Korea)</td>
<td>71.6</td>
</tr>
<tr>
<td>6</td>
<td>Sony (Japan)</td>
<td>66.6</td>
</tr>
<tr>
<td>7</td>
<td>Toshiba (Japan)</td>
<td>54.3</td>
</tr>
<tr>
<td>8</td>
<td>NEC (Japan)</td>
<td>48.2</td>
</tr>
<tr>
<td>9</td>
<td>Tyco International (US)</td>
<td>41.0</td>
</tr>
<tr>
<td>10</td>
<td>LG Electronics (South Korea)</td>
<td>37.8</td>
</tr>
<tr>
<td>11</td>
<td>Royal Philips Electronics (Netherlands)</td>
<td>37.7</td>
</tr>
<tr>
<td>12</td>
<td>Nokia (Finland)</td>
<td>36.4</td>
</tr>
<tr>
<td>13</td>
<td>Motorola (US)</td>
<td>35.3</td>
</tr>
<tr>
<td>14</td>
<td>Intel (US)</td>
<td>34.2</td>
</tr>
<tr>
<td>15</td>
<td>Mitsubishi Electric (Japan)</td>
<td>33.7</td>
</tr>
<tr>
<td>16</td>
<td>Samsung Electronics (South Korea)</td>
<td>31.7</td>
</tr>
<tr>
<td>17</td>
<td>Sharp (Japan)</td>
<td>30.5</td>
</tr>
<tr>
<td>18</td>
<td>SANYO Electric (Japan)</td>
<td>29.9</td>
</tr>
<tr>
<td>19</td>
<td>LG Electronics (Sweden)</td>
<td>28.5</td>
</tr>
<tr>
<td>20</td>
<td>Electrolux (Sweden)</td>
<td>16.4</td>
</tr>
</tbody>
</table>

Source: Prepared by FORUITE, "FORTUNE GLOBAL 500"
In order to respond to the needs of emerging markets and to increase price competitiveness, some overseas production bases are localizing such processes as product development and applied design (remodeling). In addition, there are companies procuring parts and materials from local companies. Regarding the procurement requirements, many companies said that the requirements include meeting in-house quality standards, in addition to reducing costs and ensuring a stable supply. When companies start local production, it is important to properly identify the quality standards that must be met, and maintain the right mix of such elements as prices, functions/performance and reliability that are required by the local market.

### Development of human resources in overseas bases

Companies with good business performance tend to make active efforts to retain local personnel. In order to enable overseas business bases to exercise their performance to a maximum and achieve good business results, it is important to increase the motivation of local personnel by introducing and raising awareness about the personnel evaluation and promotion systems, appointing local personnel for top local management positions and other senior posts, and delegating authority to local subsidiaries.

### Activities to Retain Local Personnel

- Introducing transparent personnel evaluation system: 12% approved, 27% not approved
- Setting salaries in light of salary levels at other companies in the same sector: 15% approved, 25% not approved
- Specifying career path for work at Japanese HQs or appointment for senior management post: 15% approved, 22% not approved
- Commending and rewarding well-performing local personnel: 15% approved, 26% not approved
- Helping well-performing local personnel study abroad / dispatch such personnel for overseas training: 22% approved, 32% not approved
- Delegating authority to local subsidiaries: 15% approved, 22% not approved
- Actively appointing local personnel for senior local posts at Japanese HQs and senior management posts: 12% approved, 30% not approved
- Enhancing OJT in routine work: 13% approved, 23% not approved
- Enhancing OJT such as in-house seminars and external training: 16% approved, 16% not approved
- Collaboration with local industries and educational institutions: 1% approved, 15% not approved

Source: Survey by METI (January 2010)

### Requirements for Procurement from Local Companies

- Meeting in-house domestic quality standards: 81% approved, 2% not approved
- Ensuring stable supply: 59% approved, 3% not approved
- Thorough commitment to delivery schedule: 55% approved, 4% not approved
- Meeting in-house local market quality standards: 24% approved, 1% not approved
- Putting in place countermeasures against technology leak: 21% approved, 10% not approved
- Developing environment for performance evaluation of procured parts: 24% approved, 9% not approved
- Having abundant information about local companies: 10% approved, 1% not approved

Source: Survey by METI (January 2010)

### Chart 2-14 Local Development and Design Activities

- Basic research: 3% approved, 5% not approved
- Applied research: 10% approved, 8% not approved
- Product development: 47% approved, 55% not approved
- Software development: 5% approved, 10% not approved
- Process technology: 10% approved, 26% not approved
- Processing technology: 10% approved, 14% not approved
- Compatible technology: 10% approved, 14% not approved
- Basic design: 24% approved, 10% not approved
- Applied design: 18% approved, 22% not approved
- Design of exterior parts: 13% approved, 16% not approved
- Evaluation of local parts/materials: 28% approved, 21% not approved
- Test/inspection: 18% approved, 22% not approved
- CAD/CAM graphics: 21% approved, 25% not approved
- Development of control software: 5% approved, 10% not approved

Source: Survey by METI (January 2010)
A survey on major companies concerning their recent business expansion abroad showed that they recognize problems related to domestic business bases, including those related to the environment for establishing business operations in Japan, while acknowledging the significance of business bases in Japan, where monodzukuri infrastructures as represented by the pool of human resources and the accumulation of technologies, are well developed.

**[Table 2-18 Opinions of Manufacturing Companies regarding Overseas Business Expansion]**

### [Reasons for relocating business operations out of Japan]
- Reasons for moving operations to foreign countries include **(1) the presence of a market and easy access to areas where there are consumers, (2) access to low-cost labor (3) the presence of well-developed infrastructures, including electricity, sales and distribution networks**.
- Selling foreign-made general-use products from the perspective of economic feasibility (labor and production costs) and proximity to the market.

### [Policy for overseas business expansion]
- Keeping in Japan the headquarters functions, research and development facilities, “mother plants” (which are “high-value-added factories” in charge of making prototypes of new products and key components) and not considering a plan to relocate these functions out of Japan.
- **Production bases should be kept in Japan in order to prevent technology leakage.** A Japanese company should move operations related to core technology out of Japan only if there is no risk of technology leakage because the overseas business base that handles the technology is majority-owned by the Japanese company or for other reasons.
- Japanese companies recognize that **because the United States and European countries are providing subsidies and tax measures as national policies to attract R&D facilities and factories, and because Asian emerging countries are also doing so to attract factories, it is becoming increasingly difficult to keep production functions in Japan.**

### [Environment for establishing business bases in Japan]
- **It is important to ensure an equal footing in terms of competitive environment as represented by environmental regulation, corporate tax, exchange rates and enforcement of the Anti-Monopoly Act.** If an equal footing is not provided, Japanese companies may have to move their business bases out of Japan.
- It is impossible to adopt a flexible employment system in Japan due to its high tax rate. The investment environment is unfavorable in Japan compared with in other countries, and **corporate earnings are also being squeezed by exchange rate movements.**
- In order to keep production bases in Japan, it will be necessary to conduct consistent and strategic initiatives, such as **providing support for capital investment and R&D (subsidies, tax measures, etc.), developing human resources, which are the wellspring of competitiveness,** and improving the education system.

### [Significance of domestic business bases]
- Planning to keep the headquarter, research, development, and mother plant functions in Japan for the moment, since **there is some demand as well as high-quality human resources and monodzukuri infrastructures.**
- If **superior production technologies and management skills owned by small and medium-size companies** continue to be kept in Japan in the future, it will be possible to keep business bases in Japan.
- Business bases have an advantage in that in Japan, it is easy to find suppliers, to form partnerships with other companies and get access to technologies due to the concentration of high technology companies.
Domestic business bases are playing an increasing role in integrating core technologies and functions, such as R&D, basic design and intellectual property management, so as to raise the technology level of the entire group. Meanwhile, the relationship between domestic and overseas bases, which used to be complementary, is gradually becoming an alternative one. However, Japanese companies’ strategies for the division of roles remain unclear. It will be important to seek to gain a global market share by optimizing the division of roles between domestic and overseas bases while taking advantage of the strengths of domestic bases.

[Chart 2-19 Roles of Domestic Bases in Production]

Source: Survey by METI (January 2010)

[Chart 2-20 Ratio of Companies Planning to Attach Importance to Domestic Functions in Future regarding Processes related to Development and Production (Top five answers)]

Source: Survey by METI (February 2010)

[Column: Komatsu Ltd. — Importance of cooperation with partners at domestic bases]

“We join hands with our partners to promote improvements and implement a 10-year plan for developing products.” Komatsu, a major construction machinery builder that earns 80% of its total revenues overseas, produces key components of construction machines in Japan only. Advanced coordination skills are required for the development and production of key components that are important for securing the performance, waste gas treatment functions and fuel efficiency of construction machines, so medium to long-term cooperation with domestic partners is indispensable for Komatsu.

Komatsu always implements its technological guidance for its partners to expand the technological capacity of its entire supply chain, including peripheral partners. It also accepts employees of its partners for its in-house training of young and managerial employees.

Komatsu’s Basic Policies of Global Production

1. Engage in assembly in regions with strong market demand.
2. Concentrate the production of key components, such as engines and hydraulic equipment, in Japan.
3. Integrate development and production operations and uplift the level of overseas plants’ capabilities under the Mother Plant System.

Source: Komatsu’s website

[Column: Yamazaki Mazak Corp. — Domestic and overseas product development arrangements for global markets]

Under its philosophy that "products wanted by customers should be swiftly developed, produced and provided at sites close to those customers," major machine-tool maker Yamazaki Mazak keeps its bases close to its customers throughout the world so as to find local needs and design and develop products for specific customers in local markets. For example, its U.S. base develops oilfield machines for which demand is robust in the United States.

Yamazaki Mazak’s domestic bases intensively produce such key components as numerical control units and ball screws for global supply. In product development, the company designs common basic standards for all machine tools, and controls and manages design and development details for markets throughout the world.

Yamazaki Mazak promotes the enhancement of its head office’s product development operations in consideration of its intensifying competition with emerging-country companies that are expanding their presence. In a bid to accelerate its product development, the company combined domestic product development bases and human resources to create the World R&D Center in the autumn of 2009 to undertake the development of test models and the establishment of production know-how and technologies.
In order to maintain and strengthen Japan’s monodzukuri skills, it is essential to increase the country’s competitiveness as a site for business operations from the global perspective. According to a survey concerning countries’ attractiveness as an investment destination, Japan excelled in such items as “R&D environment,” “infrastructure development” and “living environment for foreign residents,” while it scored poorly in “business activity costs.” As a result, Japan’s presence as a site for business operations has declined in recent years relative to other Asian countries.

### Table 2-23 Most Attractive Countries/Regions in Asia by Business Function

<table>
<thead>
<tr>
<th>Function</th>
<th>2007 Survey</th>
<th>2009 Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Asian regional headquarters</strong></td>
<td>Japan 23%</td>
<td>Japan 10%</td>
</tr>
<tr>
<td></td>
<td>China 18%</td>
<td>China 42%</td>
</tr>
<tr>
<td></td>
<td>India 8%</td>
<td>India 10%</td>
</tr>
<tr>
<td></td>
<td>South Korea 4%</td>
<td>South Korea 2%</td>
</tr>
<tr>
<td></td>
<td>Hong Kong 20%</td>
<td>Hong Kong 13%</td>
</tr>
<tr>
<td></td>
<td>Singapore 16%</td>
<td>Singapore 16%</td>
</tr>
<tr>
<td><strong>Production base</strong></td>
<td>Japan 3%</td>
<td>Japan 1%</td>
</tr>
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<td>China 62%</td>
<td>China 64%</td>
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<td>South Korea 5%</td>
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<td><strong>R&amp;D center</strong></td>
<td>Japan 30%</td>
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<td>China 25%</td>
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<td></td>
<td>Singapore 9%</td>
<td>Singapore 8%</td>
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<tr>
<td><strong>Back office operation base</strong></td>
<td>Japan 15%</td>
<td>Japan 8%</td>
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<td></td>
<td>China 24%</td>
<td>China 39%</td>
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<td>India 15%</td>
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<td>South Korea 5%</td>
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<td>Hong Kong 15%</td>
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<td>Singapore 12%</td>
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<tr>
<td><strong>Distribution base</strong></td>
<td>Japan 11%</td>
<td>Japan 3%</td>
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<td></td>
<td>China 41%</td>
<td>China 63%</td>
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<td>India 8%</td>
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<td>South Korea 7%</td>
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<td>Hong Kong 13%</td>
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<td>Singapore 9%</td>
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<td><strong>Financial operation base</strong></td>
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<td>Japan 10%</td>
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<td>-</td>
<td>South Korea 4%</td>
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<td><strong>Sales base</strong></td>
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<td>Japan 7%</td>
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<td>China 50%</td>
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<td></td>
<td>-</td>
<td>India 7%</td>
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<td>-</td>
<td>South Korea 4%</td>
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<td></td>
<td>-</td>
<td>Hong Kong 11%</td>
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</tbody>
</table>

**Remarks:**
1. The survey was conducted on companies in Europe, North America and Asia (including companies which have business operations in Japan) (209 companies surveyed in 2007 and 180 companies in 2009).
2. The figures were compiled regarding only major six countries and regions.
3. The respondents were asked to select one country or region with regard to each business function. The above figures represent the percentages of companies that made the selection (Companies that did not respond were excluded).
4. The shaded areas indicate the country or region which was selected by the most respondents with regard to each business function.

Technology leakage occurs not only through products but also through people (e.g., current and retired employees) in many cases. As efforts to prevent technology leakage are lagging at overseas business bases compared with at domestic ones amid the globalization of business operations, it will be important to take measures to prevent technology leakage.

[Chart 2-24 Pathway of Technology Leakage]

*Leakage through people*
- Employees of joint ventures or partner companies: Leakage through technological data (leakage of blueprints, production data, etc.): 30%
- Retired Japanese employees: Leakage through technological data (leakage of blueprints, production data, etc.): 16%
- Japanese employees (regular employees): Leakage through technological data (leakage of blueprints, production data, etc.): 19%
- Retired local employees: Leakage through technological data (leakage of blueprints, production data, etc.): 11%
- Local employees (regular workers): Leakage through technological data (leakage of blueprints, production data, etc.): 14%
- Local employees (non-regular employees): Leakage through technological data (leakage of blueprints, production data, etc.): 12%
- Employees of joint ventures or partner companies: Leakage through technological data (leakage of blueprints, production data, etc.): 12%
- Employees of customer companies: Leakage through technological data (leakage of blueprints, production data, etc.): 25%

*Leakage through products*
- Domestic bases (n=287): Leakage through products: 50%
- Overseas bases (n=351): Leakage through products: 40%

**Source:** Survey by METI (January 2010)

(Restructuring business strategies to take advantage of strengths: Securing a superior competitive environment (1) Prevention of technology leakage)

(Restructuring business strategies to take advantage of strengths: Securing a superior competitive environment (2) Setting global standards)

Some companies’ business activities have been undermined by problems related to standards. Most of them have suffered a cost increase as a result and have taken reactive actions, such as revising product designs. Amid intensifying technology competition around the world, Japanese companies need to fully recognize the risk of opportunity loss that may arise unless they take measures to preserve their strengths and establish their technologies as global standards. They will also need to understand the importance of maintaining and developing a superior competitive environment, including in terms of human resource development, and take necessary measures.

[Chart 2-25 Activities to Prevent Technology Leakage]

- Identifying and specifying secrets to be kept: 20%
- Establishing policy managing business secrets: 16%
- Signing confidentiality agreement with customer companies: 12%
- Acquiring intellectual property rights (patents, design rights, trademarks, etc.): 8%
- Keeping know-how technologies in Japan: 7%
- Establishing specialized post/division in charge of intellectual property rights: 5%
- Encoding and restricting access: 4%
- Restricting and recording taking out of data: 9%
- Signing confidentiality agreement with employees: 13%
- Setting a period during which retired employees are prohibited from working for a competitor: 14%
- In-house education and awareness-raising activity: 16%
- No particular activity: 18%

Source: Survey by METI (January 2010)

[Chart 2-26 Effects of Standards]

<table>
<thead>
<tr>
<th>Lost shares to competitors</th>
<th>10%</th>
</tr>
</thead>
</table>
| Product development and production costsrose | 15%
| Became unable to make, sell and export products | 21%
| Difficult to gather information about standards concerning market countries/regions | 29%
| Standards in market countries/regions change frequently | 5%

[Chart 2-27 Response to Standards in Other countries]

| Establishing specialized post/division in charge of standards | 26%
| Participating in standardization activity of industry groups | 17%
| Consulting with national and local governments | 7%
| Strengthening exchange of information with government of host countries | 4%
| Reviewing design and production to meet standards | 40%
| Strengthening exchange of information with foreign companies | 14%
| Strengthening exchange of information with companies in the same sector | 16%

Source: Survey by METI (January 2010)

[Column: Efforts to standardize antimicrobial test methods]

Japan has obtained effective international standards for digital camera formats. Canon Inc., one of the companies contributing to Japan’s setting of international standards, has given priority to the expansion of the digital camera market and positively proposed the standardization of its own specifications even at the expense of its own resources. Canon specifications have thus become the base for Japanese standards. But Canon has refrained from standardizing numbers of pixels and sizes of imaging devices (sensors to convert light into digital signals) that are available for further technological development, securing a competitive environment where it can demonstrate its optical technologies as its strength. This strategy has contributed to the Japanese digital camera industry’s maintenance of competitiveness.

[Column: Viewpoints for international standardization of digital cameras]

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[Column: Efforts to standardize antimicrobial test methods]

As testing methods were underdeveloped for antimicrobial products for which a Japanese market rapidly expanded in the 1990s, the Society of Industrial Technology for Antimicrobial Articles, which consists of antimicrobial-product producers and experts, took the leadership in adopting these methods as Japanese industrial standards, known as JIS, in 2000. In a bid to form adequate markets in foreign countries where demand for these products is expected to expand, to take advantage of JIS assets, and to maintain and enhance Japan’s world-leading competitiveness, the society then launched efforts to obtain ISO (International Organization for Standardization) standards for these methods. It introduced the relevant JIS standards to a European research organization with influence on the ISO and informed it about the JIS standards. It also provided positive support for the ISO-promoting employees of its member companies, including measures prompting member companies to lead relevant employees to focus on ISO standard obtainment efforts. Thanks to these efforts, the society obtained an official ISO standardization approval in as little as 37 months.
There are moves to secure profits by undertaking service work, such as facility maintenance and operation, as well as by providing intellectual properties and technologies, which have until now been mainly used within the group, to outside companies. The perspective of securing profits by making use of business operations before and after the production and sale of products is important.

(Restructuring business strategies to take advantage of strengths: Diversifying profit sources)

[Chart 2-29 Activities to Diversify Profit Source]

[Chart 2-30 Parent-subsidiary trade concerning technology]

Currently, the mainstay of parent-subsidiary trade is technology export to overseas subsidiaries.

Source: Survey by METI (January 2010)

Photo: Gas turbine "M501G"

(Restructuring of business strategies to take advantage of strengths: Emphasis on systems business)

Regarding infrastructure development, for which demand is expected to grow in emerging countries in Asia and other regions, it will be important to build a business model that transcends the confines of the production and sale of individual products. The Japanese manufacturing industries, which have an advantage with regard to individual products and technologies will need to redefine their business domain and secure business opportunities by forming partnerships with various companies.

[Chart 2-31 Infrastructure Investment to Be Required in Asia (from 2010 to 2020)]

($1 trillion)

Approx. $8 trillion

Water/sanitary, 0.381
Traffic/transport (roads, etc.), 2.466
Telecommunications, 1.056
Energy (electricity), 4.089

Source: Asian Development Bank

[Chart 2-32 Positions of Japanese and Foreign Companies in the Water Business]

Production of materials, parts and equipment

Design/assembly/ construction (operation) of facilities

Project operation/ maintenance /management

Veolia (France), Suez (France), GE Water (U.S.)
Siemens (Germany), DOW Chemical (U.S.), etc.

Thames Water (Australia), Hyflux (Singapore), etc.
Doosan (South Korea), etc.

Asahi Kasei, Ebara, Kubota, Kuraray, Sekisui Chemical, Teijin, Toyoobo, Toray, Nitto Denko, Hitachi Plant, etc.

IHI, Organo, Kyowakiden, Kurita, Chiyoda, Toyo Engineering, JGC, Hitachi Zosen, Hitachi Plant, Mitsubishi Heavy, etc.

(Water treatment equipment)

(Engineering)

(Trading companies)
Sumitomo, Mitsu, Mitsubishi, etc.

Local governments

Domestic business expansion

Metawater, Japan Water, etc.

Source: Prepared by METI
It is also important to make efforts to increase the value of products so as not to be trapped in price competition by taking advantage of Japanese cultural and spiritual traits.

1. Pigeon Corp.

The cosmetics maker has obtained one of the largest shares of the Chinese market.

Shiseido has taken advantage of its over-the-counter counseling services to establish a luxury brand in China. Following the achievement, Shiseido has developed products meeting consumers’ income levels and has explored sales networks.

2. Shiseido Co.

1. Pigeon Corp.

The nursery item maker has the largest share of China’s baby-bottle market.

Pigeon has promoted a brand-based strategy to push luxury products for wealthy consumers. The deliberate education of sales agents and the creation of sales corners (Pigeon Corners) have been successful.

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[Column: Transmitting Japanese brand information]

<Japan Fashion Week (JFW)>

Information is transmitted about textile materials handled by companies and about designer products. Effective business negotiations and shows for consumers are also implemented.

<“TOKYO FIBER SENSEWARE”>

The exhibition pursues new uses and potentials for textiles and introduces products that leading creators have visualized from unprecedented angles. Emphasizing technologies, the exhibition transmits information about highly functional and high-value-added Japanese textile products to the world.

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[Column: Taking advantage of brands to explore emerging markets]

1. Pigeon Corp.

(Please refer to the previous paragraph for details.)

2. Shiseido Co.

(Please refer to the previous paragraph for details.)

[Column: Introducing ergonomics to product design]

Yamazaki Mazak Corp. has cooperated with designer Kiyoyuki Okuyama to develop machine tools that feature improved visibility and operability for humans in order to ease user fatigue and stress. Specifically, the company has equipped machine tools with operation screens adaptable to the user’s body height or with wider operator doors to improve visibility for setup operations. Yamazaki Mazak thus pursues new customer values for machine tools whose developers tend to give priority to mechanical performance.

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[Column: Introducing ergonomics to product design]

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Productivity and the number of employees in Japan’s traditional craft industry have plunged to one-third of their respective peaks due to a recent increase in cheaper traditional craft imports and consumers’ limited awareness of domestic crafts. Under such situation, the Ministry of Economy, Trade and Industry is cooperating with relevant organizations in (1) the transmission of information and exploration of overseas sales channels through various trade fairs so as to exploit demand, (2) the improvement of brand value for traditional crafts and (3) efforts to secure and train successors to craftsmen in craft production areas, paving the way for craftsmen in such areas to lead younger people to take over traditional craft-making methods and skills that these craftsmen have inherited from their predecessors.

1. Exploration of overseas sales channels

It is important to transmit comprehensive information and build distribution networks in order to inform people at home and abroad of Japan’s traditional crafts, which boast high-level techniques and quality, and to explore new sales channels for these crafts. In a bid to help explore channels for sales to wealthy people in rapidly-growing China among overseas markets, METI sponsored the Japan Quality-Life Products Gallery in Shanghai from November 2009 to the end of February 2010. The gallery exhibited 190 crafts, including dishes made in collaboration between craftsmen and designers, over the three-month period (attracting about 20,000 visitors) and actively provided business negotiation opportunities. METI has thus conducted a wide range of promotions for traditional Japanese crafts.

2. Promoting branding of traditional crafts

In addition to the effective utilization of trademarks registered by local organizations (at the end of March 2010, local organizations in areas for 90 of the 211 designated crafts in Japan had registered relevant trademarks), the Association for the Promotion of Traditional Craft Industries has made efforts to increase brand values for traditional crafts. It has done so by encouraging local cooperatives to attach the symbol of a certificate of authenticity to each traditional craft product that cleared inspections that test whether crafts meet criteria covering manufacturing technologies, methods and materials.

3. Supporting programs to secure and train craftsmanship keepers

Based on the Law for the Promotion of Traditional Craft Industries, METI has subsidized a part of the costs of traditional craft production areas’ programs in order to secure and train craftsmanship keepers. In addition to training programs implemented by local cooperatives and the like to improve the skills of local craftsmen, those for the purpose of training students or adults interested in manufacturing traditional crafts to be workers for craft production areas became entitled to the subsidization in FY 2009.
In line with the globalization of business activities, it is becoming increasingly important to train domestic personnel to adapt to globalization and foster personnel who can act as global managers. In order to remain familiar with the situations and market conditions abroad and deepen collaboration with overseas business bases, it will become increasingly necessary to develop global talent.

Improving company recognition and image abroad
Globalization of personnel employed in Japan (Japanese and foreigners)
Introducing substantial training programs for personnel employed abroad
Fostering senior personnel capable of acting globally
Transferring technology and know-how to overseas bases
Optimum distribution of global talents through selection/allocation/transfer
Fair personnel evaluation, equal promotion opportunities, etc.
Introducing pay and evaluation systems to attract superior foreign personnel
Facilitating intra-company communications (including with overseas bases)
Diversity management (concerning foreign personnel) initiative
Improving understanding of and awareness about corporate philosophy and core values
Providing appropriate and flexible working style and superior employee welfare


[Chart 2-33 Key fields and Challenges related to Globalization of Human Resources]

[Column: Horiba Ltd. — Training Japanese employees for global operations]

Major measuring instrument maker Horiba has implemented a program to train young Japanese employees at overseas units for one year since the 1980s.

The globalization of Japanese employees has emerged as a major challenge at Horiba, as it has been acquiring European companies since the second half of the 1990s (overseas sales account for half of the total sales, and overseas employees make up half of its total workforce).

Under the training program, 10 young employees from various divisions take part in business operations and training at overseas units every year to experience overseas business operations and lifestyles. (In 2008, a total of 118 employees received overseas training, including 56 in the United States, 54 in Europe and eight in Asia.)

The effects of overseas training include (1) employees’ greater ambitions to work overseas after training, (2) human resources secured to undertake future global business operations (80% of Horiba executives have experienced overseas business operations), and (3) deeper cooperation between Japanese and overseas business bases through trainees serving as bridges between these bases.
Section 3 Initiatives by manufacturing industries to adapt to change and develop next-generation industries

The emergence of resource- and environment-related problems and structural changes such as the declining birthrate and the aging of society have significantly affected the Japanese manufacturing industries, for example by creating new market needs. In order to flexibly respond to such changes and establish next-generation industries that create new jobs and demand, it will be important for the manufacturing industries to take advantage of their strengths.

(New movements in the monodzukuri industries)

Companies have shown a willingness to actively enter next-generation industries and expand their business operations in light of the potential of new markets and the need to utilize business resources available in existing businesses. In some cases, companies from a broad range of business sectors have actually moved into new sectors.

**[Chart 2-34 Prospects for Next-Generation Industries]**

![Chart 2-34 Prospects for Next-Generation Industries](image)

**Source: Survey by METI (January 2010)**

**[Chart 2-35 Reasons for Entering Next-Generation Industries]**

![Chart 2-35 Reasons for Entering Next-Generation Industries](image)

**Source: Survey by METI (January 2010)**

**[Chart 2-36 Business Sectors from which New Market Entrants Come (Vehicle market)]**

![Chart 2-36 Business Sectors from which New Market Entrants Come (Vehicle market)](image)

**Source: Survey by METI (January 2010)**

**[Column: Building on Japanese Tosa handmade paper know-how to explore lithium-ion battery markets]**

Hirose Paper Mfg Co., founded in 1958 in Kochi Prefecture, has taken advantage of Japanese handmade paper know-how to manufacture synthetic fibers and capture 60% of the Japanese market for alkaline battery separators. It is now trying to utilize the handmade paper know-how to develop technologies for high-performance filters and secondary battery separators.

Nippon Kodoshi Corp. has also built on the Japanese handmade paper know-how to command 90% of the Japanese market and 70% of the overseas market for aluminum electrolytic capacitors. It is now making efforts to enter the market for separators for lithium-ion batteries.
In next-generation industries, existing business relations have undergone a certain change; for example, the influence of makers of key components and materials has increased. It will be important to build business relations in a strategic way, for example by keeping core technology.

[Chart 2-37 Changes in Parties with Influence]

In partnership with the Mitsubishi Motors Corporation, GS Yuasa Corporation (hereafter referred to as GS Yuasa) established Lithium Energy Japan as a subsidiary dealing with lithium-ion batteries for use in automobiles; in addition, it established Blue Energy as a subsidiary in the same field in collaboration with Honda Motor Co., Ltd. GS Yuasa holds 51% equity in both subsidiaries, thus taking the lead as a full-time manufacturer of batteries. With regard to lithium-ion batteries for use in automobiles, as well as batteries to be installed in new cars, GS Yuasa is aiming to secure a share of the market for replacement batteries, and is actively striving to cultivate repair and maintenance personnel. Moreover, GS Yuasa has strategically acquired patents relating to the core components and technologies, such as the materials and structures of lithium-ion batteries, and is striving to protect these.

When companies enter next-generation industries, they sometimes form business relations with new partners. Partnerships with a variety of entities through joint research activity, for example, has brought about benefits. It is important to collaborate with a variety of entities, including universities and companies, without being encumbered by existing business relations.

[Column: Initiatives Aimed at Taking the Initiative in Next-generation Technology]

In partnership with the Hiroshima Industrial Promotion Organization, 68% of companies in the prefecture, are working together on this endeavor, with the aim of responding flexibly to changes.

[Column: Developing PHV With Community-wide Cooperation]

There are many companies affiliated to Mazda Motor Corporation in Hiroshima Prefecture; in order to respond to the increasing use of electronics in motor vehicles in recent years, the Hiroshima Industrial Promotion Organization has established the Hiroshima Center for the Advancement of Car Electronics, through which it has been undertaking research and development. As an extension of such endeavors, in November 2009, the Hiroshima Industrial Promotion Organization decided to work on the development of a plug-in hybrid car in partnership with universities and automotive component manufacturers in the prefecture, with a view to its commercialization in the future. In addition to the development of plug-in hybrid cars, this project has its sights set on the development of "low-carbon models" that use domestic solar photovoltaic cells as a power source. A wide range of players, including automotive component manufacturers, universities and housing-related companies within the prefecture, are working together on this endeavor, with the aim of responding flexibly to changes.

[Chart 2-39 Joint R&D Partners in Past 3 Years]

Source: Survey by METI (January 2010)
In fiscal 2008, corporate research expenditures declined slightly (from ¥13.8 trillion to ¥13.6 trillion), marking the first decline in nine years. However, companies have shown a willingness to continue to actively conduct R&D. As for R&D themes, companies are increasingly aiming to secure profits in the medium term.

Companies are making active efforts to develop human resources with a view to entering next-generation industries. It is also important to integrate R&D resources and develop a system that enables appropriate collaboration between the R&D and other divisions.

[Column: Establishing an Organization That Cuts Across all Operational Divisions, in Order to Demonstrate Their Collective Strength]

In 2008, in order to utilize the strengths of existing business, while expanding into new projects in the field of energy and the environment, Mitsubishi Heavy Industries, Ltd. established the Energy and Environment Project Supervision and Strategy Office (hereafter referred to as the Supervision and Strategy Office), an organization that cuts across all operational divisions. Hitherto, Mitsubishi Heavy Industries had a wide range of technologies relating to energy and the environment, but each technology was stored separately in the operational division relating to the specific product. As well as identifying new needs among customers and society as a whole, the Supervision and Strategy Office has taken on the role of integrating the technologies of customers and society as a whole, the Supervision and Strategy Office.

More specifically, i) “thin-film technology for compound semiconductors”, which is expected to spread to electronic components, and ii) “the polymer surface treatment technique”, which is a technique relating to the surface treatment technique, have been designated as the two priority fields, and research and development that cuts across operational companies has been underway since January 2010. With regard to the structure, a technical fellow who can provide an overview of both technology and business, and the president of an operational company who can be directly linked to product commercialization has been undertaken by the holding company, Asahi Kasei Corporation, while research and development relating to business has been undertaken by subsidiary operational companies; the group has now stipulated priority fields on which the resources of the group as a whole will be concentrated, in order to work on next-generation product development in the group as a whole. More specifically, i) “thin-film technology for compound semiconductors”, which is expected to spread to electronic components, and ii) “the polymer surface treatment technique”, which is a technique relating to the surface of substances for improving efficiency in fields where the surfaces condense or emit light, such as lighting and solar photovoltaic power generation, have been designated as the two priority fields, and research and development that cuts across operational companies has been underway since January 2010. With regard to the structure, a technical fellow who can provide an overview of technology and the president of an operational company who can promote development from the perspective of an entrepreneur have been selected as the top managers, and have initiated discussions that cut across business fields from the perspectives of both technology and business.
It will be important for Japan to carry out initiatives to improve the environment for developing next-generation industries before other countries do, such as providing financial support for such industries and promoting demonstration experiment projects.

**Initiatives toward the establishment of production bases for next-generation industries**

- Major countries around the world are providing support for the establishment of the production bases for next-generation industries, mainly low-carbon industries.

<Initiatives in the United States and Europe>

- **United States**: Inviting the construction of factories for high-efficiency batteries and related parts and materials by offering subsidies equivalent to 50% of the necessary cost (total size of the subsidy scheme: approx. ¥190 billion).
- **United Kingdom**: Offering subsidies and loans for the construction of domestic factories for electric vehicles and lithium-ion batteries for automotive use.
- **Japan**: Also trying to promote the establishment of business operations by low-carbon industries in the country by allocating budget funds for the “subsidy to cover the cost of projects to promote facility construction by low-carbon, job-creating industries” (budget funds of approx. ¥29.7 billion allocated under the second supplementary budget for fiscal 2009).

**Urban demonstration projects for EVs and PHVs**

- The “Urban EV and PHV Concept” is a model project for a demonstration experiment to prepare for the Full-fledged dissemination of electric vehicles (EVs) and plug-in hybrid vehicles (PHVs).
- In this project, model areas are selected for the creation of initial demand. It aims to disseminate EVs and PHVs nationwide by establishing a dissemination model through the introduction of an incentive for the development of battery-charging infrastructure and the use of such vehicles in cooperation with local governments and local companies so as to create initial demand (introduction of EVs and PHVs), and through intensive implementation of awareness-raising activity and impact evaluation.

### Broad experiment areas

<table>
<thead>
<tr>
<th>Experiment areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tokyo and Aomori, Niigata, Fukui, Aichi, Kanagawa Kyoto and Nagasaki Prefecture</td>
</tr>
</tbody>
</table>

[Introducing as vehicles for public and business use](Image1)

[Resolving concern over driving range by developing a fast-charging network](Image2)

[Column: Environmental Improvement Aimed at the Popularization of Electric Vehicles in Germany]

In August 2009, the German Government launched its National Electric Mobility Platform, which was aimed at accelerating environmental improvements and research and development into electric vehicles.

As well as measures to support research and development aimed at promoting the development of battery technology, such as lithium-ion batteries, this platform incorporates environmental improvement measures such as the implementation of test demonstrations and the promotion of electrical charging infrastructure installation, and sets the target of putting one million electric vehicles into practical use by 2020.

In Germany, projects aimed at the popularization of electric vehicles are underway in various parts of the country; in Berlin, Daimler and the electric power company RWE AG are working in partnership on the implementation of e-mobility Berlin. In this project, as well as Daimler providing more than 100 electric vehicles under its own brand, RWE is installing and operating charging points in approximately 500 locations. Based on such infrastructure development, Daimler is planning to begin commercial production of electric vehicles in 2010.
Efforts to set standards will be important for creating new markets through corporate activities in response to the growth of potential market needs that come with the emergence of social challenges.

○ Accessible Design is Changing Needs into Markets
With regard to the accessible design (the design of products that are easy for elderly people and people with disabilities to use) products, the Accessible Design Foundation of Japan, which is an industry group, is at the center of ongoing endeavors in the field of international standardization activities, such as discussions concerning the overall picture with regard to international standards, the formulation of draft standards and the proposal of new standards. Through such endeavors, the market for accessible design products has continued to expand, and is estimated to have totaled ¥3.2 trillion in fiscal 2007 (an increase of 8% compared with the previous year).

○ Initiatives Concerning Life-support Robots
In fiscal 2009, the Ministry of Economy, Trade and Industry launched the Life-support Robot Practical Application Project. In the medium to long term, we will enter an age when there will be a lack of human resources, so the need for life-support robots in various areas of life is increasing. Amidst this situation, it will be necessary to increase their degree of contact with humans and to ensure even better safety, but no technical standards or rules have been set with regard to the safety of robots in relation to humans, so development risks are high.
The Life-support Robot Practical Application Project is aiming to establish human safety technology, standards and verification techniques, which have been an issue affecting the popularization of service robots in lifestyle fields, and to promote international standardization. Through this endeavor, it is hoped that the development of life-support robots, which has not hitherto progressed due to a lack of understanding of safety standards and rules, will accelerate.

Efforts to secure safety in the product design stage amid the growth in the complexity of products and the increase in the use of electronic control bring benefits to the production process and leads to an improvement in social trust.

[Chart 2-43  Effects of Efforts to Secure Safety in Product Design Stage]

Source: Survey by METI (January 2010)
Section 4 Japanese manufacturing industries are required to deal with resource and environmental constraints

An increase in the consumption of resources and energy as a result of growth in demand in emerging countries and increasing environmental constraints such as global warming have come to affect the global economy and the competition strategies of manufacturing companies. In order for the Japanese manufacturing industries to increase their presence by taking advantage of their technological superiority, they need to implement marketing activities suited to individual markets, adapt themselves to the various needs for their technologies, and develop and retain human resources that contribute to the strengthening of technological capability as a stepping stone to success in next-generation industries.

As resource prices have been rising since the international market experienced significant volatility last year, the production costs of the manufacturing industries remain at a high level. In addition, China is strengthening its activity to secure resources. The environment for procurement of resources to overcome resource constraints has changed since the volatility hit the international market, and companies’ international competitiveness has come to depend on their procurement capability. Consequently, companies have taken measures to secure resources.

Rare metals are essential materials for high value-added and high-function products such as IT products and next-generation vehicles, and securing their stable supply is critical from the viewpoint of maintaining and strengthening the international competitiveness of the Japanese manufacturing industries. In particular, more than 90% of rare metals are produced in China, and the country’s restrictions on exports due to its resource protection policy has had a significant impact.

[Chart 2-40 Uneven Distribution of Rare Metals (Shares of Countries in Rare Metal Production)]

In order to better deal with resource price volatility, Japanese manufacturing companies have started not only to reduce costs but also to review their procurement strategies and strengthen technology development. In particular, in addition to reducing the number of suppliers and strengthening the internal procurement system, they are implementing measures that they did not take in normal times, such as reviewing the terms of contracts with suppliers, so as to increase their procurement power.

Regarding resources for which a price rise is expected in the medium to long term, progress is being made in the development and use of alternative materials. However, in order to secure resources in the future, strategic initiatives will need to be implemented jointly by the public and private sectors.

Moves by automobile manufacturers and automotive component manufacturers to switch materials are underway. Toyota Boshoku Corporation, Toyota Motor Corporation and Toray Industries Inc., which have been undertaking joint development endeavors focused on the theme of "making all parts of the car interior from plant-derived materials", are selling a new type of car in which bioplastics have been used for approximately 60% of the surface area of the car interior, by using plant-derived polyester for the surface materials, polyol derived from castor oil for the seat cushion pads, and kenaf fiber and polylactic acid as the base materials for the door trim ornaments. The use of materials such as kenaf and polylactide derived from castor oil is also spreading to the products of other vehicle manufacturers, and bioplastics are already becoming established as materials that fulfill the functions required of automotive components. In addition, Toyota Boshoku Corporation is aiming to use plant-derived materials for 20% (on a weight basis) of car interior materials in the medium to long term. Thus, with the aim of switching the materials used for automotive components under conditions of limited resources, efforts to introduce bioplastics, which will contribute to curbing the use of fossil fuels, are accelerating.

In Kazakhstan, a project relating to securing rare earth resources, which brings together the public and private sectors, has got underway, and the following two projects were announced at the 1st Japan-Kazakhstan Joint Public-Private Sector Economic Conference, which was held in October 2009.

Sumitomo Corporation, the Japan Oil, Gas and Metals National Corporation (JOGMEC) and the Kazakhstan National Atomic Energy Corporation Kazatomprom (hereafter referred to as Kazatomprom) are undertaking a project focused on recovering rare earths from uranium ore residue that was formerly obtained by strip mining; they have established a joint venture aimed at undertaking a feasibility study, and are verifying the potential profitability of the rare earth recovery project using the existing facilities at the Ulba Metallurgical Plant, which is under the auspices of Kazatomprom. In the event that the prospects are good for ensuring the profitability of the project, the aim is to establish a system for producing 3,000 tons of rare earths annually from the end of fiscal 2010 at the earliest; this amount equates to around 10% of total annual demand for rare earths in Japan.

Moreover, Toshiba Corporation and Kazatomprom are undertaking a project focused on recovering rare metals and rare earths from wastewater generated during the mining of uranium ore. This project focuses on extracting dysprosium, neodymium and rhenium from wastewater from working uranium mines, after the uranium has been extracted, and both companies are currently considering the establishment of a joint venture.
Growing awareness about environmental constraints such as the need to cope with global warming has brought about changes in corporate strategies. For example, companies are accelerating efforts to adapt their production divisions to environmental constraints, shifting to environment-friendly products and actively introducing equipment with high resource productivity. In their strategies for responding to environmental constraints, companies are shifting emphasis from reactive actions to proactive actions, although there are differences in strategy according to the corporate size.

![Chart 2-50 Actions Taken on Assumption of Future Environmental Constraints]

Source: Survey by METI (December 2009)

Although some companies think that environmental constraints increase their competitiveness, many companies, especially small and medium-size companies, recognize that such constraints pose a risk to their business management.

![Chart 2-51 Future Impact of Environmental Constraints on Business Operations]

Source: Survey by METI (December 2009)

At the Wakayama plant of the Panasonic Corporation Energy Company, responses to environmental constraints in the form of reductions in CO2 emissions, and cost reductions through energy conservation are being implemented through the construction of a management system that has introduced energy conservation simulation technology to production processes, under the concept of the “eco ideas plant: a plant undertaking production of energy-storing products through energy conservation”. This seemingly contradictory initiative, in which the volume of CO2 emissions is reduced even as production volumes rise, has been made possible through utilizing in-house knowledge in the form of cooperation with the company’s production technology research institute, which specializes in strengthening the company’s production technology and manufacturing plants. In constructing this management system, a simulation of the optimal operating conditions for equipment in major processes was undertaken, based on the results of surveys conducted at the plant by the production technology research institute. In addition, a monthly Eco-Environment Meeting is held at the Wakayama plant, in which all employees participate, exchanging opinions concerning initiatives aimed at energy conservation in production processes; by reforming not only production processes, but also the environmental awareness of employees, the plant is undertaking endeavors aimed at improving productivity through reducing CO2 emissions and conserving energy.

![Chart 2-52 Recognition of Risk Posed to Corporate Management by Environmental Constraints]

Source: Survey by METI (December 2009)
In addition to strengthening their control system for responding to environmental constraints, individual companies are making focused investments from a long-term perspective as their management task. Although the total amount of R&D expenditures and capital investments by Japanese manufactures declined in fiscal 2009, investments for the purpose of responding to environmental constraints remained flat compared with fiscal 2008, with some 30% of companies increasing such investments.

Source: Survey by METI (December 2009)

In particular, Japanese manufacturers are making their production processes more energy-efficient and are shifting to the production of energy- and resource-saving products. In addition, they are increasing investments in R&D programs that support such activities and are strengthening efforts to increase their competitiveness, mainly by making improvement in terms of energy and resource saving.

In particular, Japanese manufacturers are making their production processes more energy-efficient and are shifting to the production of energy- and resource-saving products. In addition, they are increasing investments in R&D programs that support such activities and are strengthening efforts to increase their competitiveness, mainly by making improvement in terms of energy and resource saving.

Nippon Steel Corporation is developing well-formable, ultra-high-strength sheet steel, which fulfills the three conditions of collision safety, lightweight and good formability, thereby accelerating a change in materials. By utilizing existing equipment and undertaking advanced integrated controls in manufacturing processes (steel manufacture, hot rolling, annealing), without adding rare metals such as chrome, nickel or molybdenum, it is possible to mass-produce high-strength sheet steel that is thinner than conventional high-strength sheet steel, while still ensuring a certain level of quality. The well-formable, ultra-high-strength sheet steel developed by the company can adapt to a variety of forming process methods, and ensures the level of formability required in a variety of automotive components, so the areas in which it can be used have expanded significantly in recent years and the quantity of orders received is increasing. At other companies, the application of aluminum components in vehicle body panels, the switch from metal to plastic in back door modules and fuel tanks, and the introduction of magnesium alloys in engine components are being undertaken with the aim of making vehicles lighter in weight, so research and development focused on new materials and competition to commercialize these have got underway.
In addition to measures related to restrictions on the production and use of chemicals, individual companies are building and improving management systems for responding to environmental constraints so as to adapt to restrictions on the volume of greenhouse gas emissions. Response to environmental constraints has grown from a factory-level activity to a company-level initiative. In the future, companies will need to collaborate with each other in further improving efficiency.

[Chart 2-56 Status of Enhancement of Management System to Respond to Environmental Constraints]

<table>
<thead>
<tr>
<th>Action</th>
<th>Materials producing industry</th>
<th>Parts producing industry</th>
<th>Finished goods producing industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building and improving management system to respond to environmental constraints</td>
<td>59.6%</td>
<td>25.3%</td>
<td>14.1%</td>
</tr>
<tr>
<td>Shifting from factory-level activity to company-level initiative</td>
<td>25.3%</td>
<td>21.7%</td>
<td>25.6%</td>
</tr>
<tr>
<td>Establishing specialized division in charge of environmental constraints</td>
<td>14.1%</td>
<td>16.9%</td>
<td>14.7%</td>
</tr>
<tr>
<td>Securing budget funds for responding to environmental constraints</td>
<td>11.9%</td>
<td>15.6%</td>
<td></td>
</tr>
<tr>
<td>Increasing personnel for responding to environmental constraints</td>
<td>7.1%</td>
<td>7.1%</td>
<td>9.4%</td>
</tr>
<tr>
<td>Others</td>
<td>5.1%</td>
<td>1.2%</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

Source: Survey by METI (December 2009)

[Column: Improving Energy Conservation and Resource Conservation Through Cooperation Between Businesses]

In October 2009, Sharp Corporation began running a plant in Sakai City, Osaka Prefecture, which has better energy and resource conservation abilities than the Kameyama plant. The industrial complex where this new Sakai plant is located is home to 19 companies, including businesses manufacturing liquid crystal panels, and through the results of this accumulation of companies and collaboration between them, higher efficiency production, such as improved energy and resource conservation, is being achieved.

For example, the company is undertaking centralized management of energy use within the complex through its Integrated Energy Center, which it is using to curb inefficient energy use and to promote the horizontal deployment of measures to prevent inefficient energy use. Moreover, within the complex, in order to reduce work-in-process and completed product inventory, production management information such as production plans and production volumes in each process is used in the unified management of the supply chain as a whole, from the upstream component and material plants to the downstream assembly plants, and incorporated into the unique automatic transfer system between each process. Furthermore, as well as introducing LED lighting developed by the company into all its plants, it plans to install solar photovoltaic power generation facilities on the roof of each of its plants, and is also ensuring thorough implementation of energy conservation measures in its plants.
Japanese manufacturing industries are superior to foreign competitors in terms of technology development capability (R&D and product development) and technology that contributes to energy and resource saving in production processes. In particular, they excel in the field of technologies for energy- and resource-saving products, which are intended to resolve problems specific to Japan, a resource-poor country, and which play an important role in environment-related industries. Such technologies include those that reduce product weight and size and extend the operating life of products. On the other hand, Japanese manufacturing industries are inferior in terms of marketing power, which is necessary for expanding sales of energy- and resource-saving products, and capability to develop and retain human resources.

[Chart 2-57 Japanese Companies’ Superiority in Energy and Resource Efficiency Compared with Foreign Competitors]

(Kunimoto Industry Co., Ltd. has succeeded in developing the “innovative tube forming system,” which leads to the automation of manufacturing processes such as bending, tube expansion, forming, and wall thickness control. This system combines the company’s various original processing technologies to lessen the previous 17 processes into nine, and reduces energy input and personnel costs, and also significantly enhances production efficiency, by adopting a streamlined production method. The company invests 10% of its total sales in R&D activities to further develop technologies and apply developed technologies in response to customers’ needs. Efforts to meet severe specifications for the lightening and upgrading of products required by downstream manufacturers have eventually worked to enhance energy-saving and resource-saving effects of final products. The company’s performances can be cited as some of the best practices that show success in promoting the return of products manufactured overseas into the Japanese market through active technology development.

A product made by replacing the cast components with pipes by integral molding, which was successful in reducing weight and saving energy and resources.

(Mitsubishi Electric Corporation has the world’s top share in the power device market, having made contributions widely in industrial fields covering from industrial instruments to train cars. The company succeeded in the world’s first demonstration of a SiC inverter in January 2006. In November 2009, the company introduced a technology to further reduce power loss and proved a 90% reduction of power loss compared to conventional Si inverters. Due to a wide range of potential applications, the SiC inverter technology is expected to be utilized in various products, including air-conditioning equipment, power conditioners for solar photovoltaic systems, and elevators.)

Prototype inverter using SiC, on which hopes are pinned as a power device material.
Although Japan is superior in environment-related technologies, it is difficult to apply many of such Japanese technologies in other countries without modification due to differences in the market environment and cost constraints. In order to enable Japanese manufacturing industries to exercise their strengths in an immature environment-related market, it is necessary to find demand by identifying the needs through consulting activity, for example, and establish a stable profit base through activities such as maintenance work.

Yokogawa Electric Corporation led the world in developing a distributed control system, which conducts control and monitoring of production facilities of plants. The company has already sold more than 20,000 systems all over the world and is highly evaluated in the global markets. The company started to provide an energy-saving diagnosis service by combining the control technology that it has accumulated over the years and global trends in the needs for energy and resource conservation. This energy-saving diagnosis service, which aims to reduce energy consumption by way of enhancing production efficiency at factories, utilizes various software tools to reveal the operation status of production facilities so as to detect and eliminate waste. Through this service, the company helps customers realize energy and resource conservation without making large scale investment, and supports their improvement activities continuously. Thus, overseas expansion of Japan’s manufacturing industry through consultation in the field of software, which is expected to lead to the introduction of facilities and equipment for enhancing energy and resource conservation at local production sites and to the discovery of potential renewal demand, will be considered more and more important in the future.

Meanwhile, Japanese manufacturing companies face a shortage of personnel necessary for R&D programs intended to improve resource productivity. In addition, there is also a shortage of personnel capable of performing facility operation and maintenance work necessary for spreading environment-related technologies and environment-friendly products. Although Japanese manufacturing companies are dealing with these shortages by relocating personnel from other divisions and increasing new hiring, it is urgent for them to foster and secure such personnel, either in Japan or abroad.
The difficult situation may continue even in the phase of economic recovery. However, it will be necessary to take measures to foster skilled workers necessary for a future expansion of business operations.

1. Employment-related problems facing monodzukuri industries

In fiscal 2008, slightly more than 70% of companies suffered declines in the value of sales and shipments compared with the previous year. In particular, the ratio of companies whose sales were less than 70% of the previous year’s level came to around 20%. In the production-use machinery industry and business-use machinery industry, the ratio of such companies came to around 30%.

At companies that depended mainly on foreign markets, the decline in the value of sales and shipments was more conspicuous than at companies that depended mainly on the domestic market. Concerning the question about the trend in the value of sales and shipments over the past three years and the prospects for the next three years, “a downturn followed by a gradual recovery” was the most common response, cited by about 40%. However, nearly 40% in the steel industry cited “an upturn followed by a downturn” and about 25% in the electric machinery and equipment manufacturing industry cited “(a downturn followed by) a crawl along the bottom,” indicating divergence in the ability to recover from recession.
With regard to specific challenges facing Japanese companies, nearly 90% of companies pointed out that “product prices have gone down” (including companies that recognized a slight drop) compared with three years before, about 75% said that “competition in terms of product quality has intensified,” and about 70% pointed out that “the needs of customers have diversified.” It is evident that Japanese companies find themselves in a difficult situation where, while product prices have dropped, quality competition has become more severe.

Regarding specific employment adjustment measures implemented over the past one year, the survey indicated that most such measures were intended to maintain jobs: 75% put curbs on overtime work and the ratios of companies that temporarily closed factories and those which put curbs on new employment exceeded 50%. On the other hand, the ratios of companies which dismissed employees and those which invited early retirement came to around 10%.

Source: JILPT “A Research about Human Resources Development of Technicians Under Changeable Economic and Business Situation(2009)”

Source: JILPT “A Research about Human Resources Development of Technicians Under Changeable Economic and Business Situation(2009)”
2. Capabilities to be expected from monodzukuri workers and development of human resources

Regarding excess or shortage of skilled workers, about 40% of companies felt that there was an appropriate number of managers/supervisors and another 40% or so recognized a slight shortage of such personnel, while slightly more than 10% perceived a shortage. As for cross-trained workers, technically skilled workers and highly skilled workers, around 50% recognized a slight shortage, some 30% felt that there was an appropriate number of such workers, and just over 10% perceived a shortage. These ratios were similar among companies that suffered a conspicuous decline in the value of sales and shipments in fiscal 2008 compared with the previous year. Companies expect skilled workers to have a high skill level. At the moment, 40–50% of companies acknowledge that the capabilities of skilled workers have not reached a satisfactory level.

[Chart 3-6 Current excess or shortage of regular skilled workers]

[Chart 3-7 Excess or Shortage of Regular Skilled Workers (at companies whose sales dropped more than 30% in fiscal 2008)]

[Chart 3-8 Evaluation of the Average Skill Level of Regular Skilled Workers]

Source: JILPT "A Research about Human Resources Development of Technicians Under Changeable Economic and Business Situation(2009)"

Source: JILPT "A Research about Human Resources Development of Technicians Under Changeable Economic and Business Situation(2009)"

Source: JILPT "A Research about Human Resources Development of Technicians Under Changeable Economic and Business Situation(2009)"
According to a survey on the types of the knowledge and skills that companies expect from skilled workers, skills in individual fields alone are not valued much. The capability to manage the whole production line, including knowledge and skills necessary for rationalizing the production process, is valued.

On-the-job training (OJT) is the main education and training method. As for the prospects for the next three years, the importance of off-the-job training (Off-JT), which is implemented separately from routine work, is expected to grow.

Regarding measures taken to develop skilled workers’ capabilities, nearly 70% of companies were “encouraging workers to make improvements and suggestions” and about 60% provided “technical education,” indicating high expectations in these areas.

**[Chart 3-9 Knowledge and Skills Expected from Skilled Workers (multiple answers allowed)]**

Source: JILPT “A Research about Human Resources Development of Technicians Under Changeable Economic and Business Situation(2009)”

**[Chart 3-10 Education and Training of Regular Skilled Workers (multiple replies allowed)]**

Source: JILPT “A Research about Human Resources Development of Technicians Under Changeable Economic and Business Situation(2009)”

**[Chart 3-11 Initiatives Aimed at Capability Development (multiple answers allowed)]**

Source: JILPT “A Research about Human Resources Development of Technicians Under Changeable Economic and Business Situation(2009)”
From the perspective of the relationship between human resource development and the economy, in times of recession, securing funds for education and training is expected to become difficult while securing time for such purposes is likely to become easy. As for the actual implementation of education and training, reflecting the above-mentioned causality, the ratio of companies that provided Off-JT training decreased slightly compared with three years before and the ratio of companies that provided OJT in a systematic manner increased slightly. Around 20% of companies intend to increase education and training of regular skilled workers and some 50% expressed the intention to slightly increase education and training, indicating growing moves to devote efforts to education and training.

Source: JILPT “A Research about Human Resources Development of Technicians Under Changeable Economic and Business Situation(2009)”
With regard to the use of non-regular skilled workers, some companies give consideration in terms of job placement and employment terms and conditions for such workers; for example, nearly 40% said they assigned a job according to the workers’ capabilities and slightly over 30% offered terms and conditions according to their job performance. However, only 5% devoted efforts to support for their career prospects.

As for the employment longevity of part-time workers, those who had worked for five years or longer increased to account for more than half. However, the wage gap between such workers and full-time workers has narrowed little over the past 10 years in terms of hourly regular wages.

It is necessary to develop career prospects for non-regular workers in general from a short- to long-term perspective by appropriately evaluating their vocational capabilities and by making use of their capabilities as long as possible.

[Chart 3-15] Issues being considered in the use of non regular technical workers at manufacturing sites (multiple answers allowed)

<table>
<thead>
<tr>
<th>Issue</th>
<th>0%</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assigning a job according to workers’ capabilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>36.6</td>
</tr>
<tr>
<td>Offering terms and conditions according to job performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>33.0</td>
</tr>
<tr>
<td>Encouraging workers to participate in small group activities and QC circles at production site</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>21.1</td>
</tr>
<tr>
<td>Limiting the scope of assignment to certain areas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>21.0</td>
</tr>
<tr>
<td>Placing emphasis on implementation of education and training programs, and assisting the implementation of such programs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17.7</td>
</tr>
<tr>
<td>Keeping the number of workers below a certain level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14.9</td>
</tr>
<tr>
<td>Placing emphasis on developing mid- to long-term career prospects, and assisting their career development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.8</td>
</tr>
<tr>
<td>There are no qualified personnel at the moment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>27.5</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.2</td>
</tr>
</tbody>
</table>

No specific issues are being taken into consideration in the use of workers

Source: JILPT “A Research about Human Resources Development of Technicians Under Changeable Economic and Business Situation(2009)”

[Chart 3-16 Changes in the Mix of Part-Time Workers by Employment Longevity and in the Wage Ratio Compared with Regular Workers (adjusted for the difference in the age mix)]

<table>
<thead>
<tr>
<th>Industry total</th>
<th>Manufacturing industries</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 year</td>
<td>35.6</td>
</tr>
<tr>
<td>1-2 years</td>
<td>68.5</td>
</tr>
<tr>
<td>3-4 years</td>
<td>16.1</td>
</tr>
<tr>
<td>5 years</td>
<td>27.4</td>
</tr>
<tr>
<td>Wage ratio</td>
<td>20.8</td>
</tr>
</tbody>
</table>

Remarks 1: The wage comparison is made in terms of hourly regular wages.
2: The difference in the age mix was adjusted in the following way:

(1) Regarding the employment longevity mix, the age and employment longevity mixes in 1999 and 2004 were weighted so as to keep the age mix for each year the same as the one for 2009.
(2) Regarding the wage ratio, the comparison was made between the regular wages for part-time workers by age that were weighted in light of the age mix for regular workers and the regular wages for regular workers.

Source: MHLW “Basic Survey on Wage Structure”
Among the factors most frequently cited as a strength compared with other companies of a similar size in the same industry are those related to the improvement and the exercise of the capabilities of skilled workers, such as: flexibility to meet detailed requirements imposed by the order-placing company, which was cited by slightly over 70%; product quality, cited by about 65%; and short delivery time and the quality of skilled workers, both of which were cited by some 50%.

As for factors to which companies plan to devote particular efforts for the next three years, the quality of skilled workers was cited by around 55%, product quality by some 50%, low cost by slightly more than 40% and product development capability by around 35%.

Among companies that regard China as the greatest threat in terms of competition, the ratio of those that plan to place particular emphasis on the quality of skilled workers came to some 60%, higher than the ratio among companies that regard the United States, Europe or other Asian countries as the greatest threat.

Compared with in other countries, the value of manufacturing skills has been well recognized in Japan, with high levels of skills preserved and handed down from generation to generation. In order to prevent short-term needs required by global economic competition from causing the tradition of respecting monodzukuri to be neglected and the initiatives to improve the capabilities of skilled workers to be weakened, it is desirable to devote efforts to the development of human resources, particularly those that play the central role in the manufacturing workplace, and to maintain Japan’s advantage over other countries in manufacturing skills.

[Chart 3-17 Evaluation in Comparison with Other Companies of a Similar Size in the Same Industry]

Source: JILPT “A Research about Human Resources Development of Technicians Under Changeable Economic and Business Situation(2009)"

[Chart 3-18 Factors to which Companies Plan to Devote Particular Efforts for the Next 3 Years]

Source: JILPT “A Research about Human Resources Development of Technicians Under Changeable Economic and Business Situation(2009)"

[Chart 3-19 Regions/Countries Where Companies plan to Devote Particular Efforts to Improvement of Quality of Skilled Workers (regions/countries regarded as the greatest threat as a competitor)]

Source: JILPT “A Research about Human Resources Development of Technicians Under Changeable Economic and Business Situation(2009)"
Section 2 Skill development measures related to monodzukuri (Public job training)

As there are few private-sector vocational training organizations in the manufacturing sector, including the automobile, electrical equipment, and machinery industries, public vocational training is expected to play a particularly important role. Public vocational training programs are designed to train workers in the use of the kind of sophisticated machinery which has been used at manufacturing sites so as to make them highly skilled workers capable of serving as the core human resources of monodzukuri industries in the future. In addition, the programs provide training for existing workers through training courses related to advanced knowledge and skills in a wide range of advanced fields, such as adaptation to new technologies and improvement of production processes.

Regarding training of people who have quit their jobs, about 30% of the existing programs of training courses are revised or abolished each year in light of technological trends, local worker needs, the results of surveys on and hearings with business groups by taking account of the division of roles between public and private training organizations and local governments.

[Chart 3-20 Review of Training Curriculum Based on the PDCA Cycle]
While it is regarded as necessary to provide each worker with an opportunity to improve his/her capabilities and create a society in which each worker can exercise their capabilities, some “freeters” and other types of workers have no option but to work as non-regular workers, as they cannot be employed as full-time workers because of a lack of opportunities to improve their capabilities so as to qualify for a full-time job.

The “Job-Card system” has been launched to help “freeters” and those who have little experience of working as full-time workers obtain a full-time job by (i) raising their awareness about work through comprehensive career counseling and identifying the issues they face in career formation, (ii) providing such people with an opportunity for practical vocational training comprising job training at companies and lectures and (iii) summarizing companies’ evaluation of their job performance and their job experiences in a Job-Card.

The New Growth Strategy (Basic Policies) (adopted upon a cabinet decision on December 30, 2009) seeks to further promote the Job-Card system by setting the goal of increasing the number of Job-Card holders to 3 million.
The national technical skills test is a national certification program to test and certify the skills of workers based on certain criteria. It is designed to motivate workers, including monodzukuri workers, to acquire skills, and it has contributed to improving the social status of workers.

Over the past five years, the number of people who took this test with regard to the types of jobs vital to manufacturing industries has increased, particularly among specialized senior high school students. More and more young people are expected to strive to acquire skills if the national technical skills test is promoted, for example by recommending that students take the test.

[Chart 3-22 Changes in the number of people who took the national technical skills test]

[Column: Messages from Meisters – Creation of a workplace that fosters Meisters and promotes their activity]

This project is intended to contribute to improvement of the working terms and conditions for qualified skilled workers (who have passed the national technical skills test) by communicating the importance of their superior skills widely among companies and the general public through the publication of excellent examples of human resource development and treatment of workers and the use of qualified skilled workers for the development and manufacturing of products.

<Example>

Castec Inc. manufacturers custom-made core pins and inserts for die cast molds.

The company has continued to improve its financial results for the past several years, with its workforce increasing from around 80 ten years ago to more than 150 now. It is a very youthful company, with an average employee age of 33.1 and average employment longevity of 6.6 years. Because of a rapid increase in the number of young employees, the company once faced problems such as: that the organization was weakened by the cronyism resulting from the narrow age gap between team leaders and subordinates; that team leaders’ cannot win the trust of subordinates due to uncertainty over their levels of expertise and skills; and that team leaders do not have the confidence to give guidance to subordinates because they do not have comprehensive knowledge about materials, electricity and maintenance, despite their know-how about machinery operation. Castec started to make earnest efforts to have employees take the national technical skills test after its director in charge of general administrative affairs was told by an official of another manufacturer located in the same industrial zone that it was natural for technical workers to pass at least Level 2 of the test.

Thereafter, the company made it a policy to require team leaders or employees with higher positions to pass the national technical skills test so as to differentiate their skill levels from those of subordinates and disclose the qualifications acquired through the test. In principle, an employee cannot be promoted to the position of team leader unless they pass at least Level 2 of the national technical skills test. In addition, the company set the goal of having all employees pass Level 2 in the field of machine processing, requiring employees with three years or more of work experience to take the test. Castec is making active efforts to train employees and bear costs related to the training of employees at a machinery maker and a polytechnic center and to in-house lectures provided by invited lecturers, including lecture fees, traffic expenses and wages.

A total of 38 employees have passed the national technical skills test, and they have been allocated throughout Castec’s manufacturing department as managing supervisors or workers. Because the levels of their knowledge and skills have been confirmed by the national technical skills test, they give guidance to subordinates with confidence. Moreover, they have become able to actively express their opinions at meetings.

Ten years ago, the goal for the company’s employees was to pass Level 2, and now, they aim to achieve Level 1. Employees’ efforts to improve the level of their own skills have led to an improvement of the technological level of the entire company. Employees, particularly skilled workers, have become actively involved in business process improvement and cost reduction efforts, thereby creating a strong company with an organization that thinks for itself.
To realize a “manufacturing-oriented nation,” it is important to foster an atmosphere of respect for skills among all people, from children to adults, and to recognize anew the importance of developing monodzukuri industries and developing human resources that support it.

### [Column: Successful performance at the International Youth Skill Olympics in Calgary]

The International Youth Skills Olympics has been held biannually in order to promote vocational training and improve the level of skills in the participating countries through international competition among young skilled workers and to promote international exchanges and friendships between young skilled workers. Japan has participated in it since 1962. In the International Youth Skill Olympics held in Calgary, Canada in September 2009, Japanese workers won gold medals for six job types, and Japan ranked third in the medal haul with a total of 14 gold, silver and bronze medals.

### [Column: Outstanding Skills — National Skills Competition]

The National Skills Competition has been held every year since 1963 in order to provide young skilled workers in Japan with goals to strive toward through the opportunity to compete with each other in terms of the level of skills on a nationwide scale. The 47th National Skills Competition was held in October 2009, mainly in Hitachi and Hitachinaka Cities, Ibaraki Prefecture, with 983 contestants participating in events for 40 types of jobs.

### [Column: Raising Awareness — Youth Monodzukuri Skills Competition — ]

In order to raise young people’s awareness about monodzukuri skills and train them into fully skilled workers, it is necessary to give them a goal for skills acquisition and an opportunity for skills competition. Therefore, the Youth Monodzukuri Skills Competition is held for people aged 20 years or younger who are striving to acquire skills at vocational capability development facilities, recognized vocational training facilities and technical senior high schools so as to give them goals and encourage them to improve their skills, thereby increasing the number of young skilled workers.
Chapter 4 Current State of, and Challenges in relation to, the Education, Research and Development to Support the Basis of Monodzukuri

Section 1 Development of monodzukuri human resources and enhancement of career education and vocational education

In order for Japan’s manufacturing industries to overcome their various challenges and achieve sustainable development amid the ongoing significant changes in the domestic and foreign economies, the development of human resources that support the industries and the promotion of science and technology that create innovation are essential.

1 Social changes and the importance of career education and vocational education

(Status of transition from school to society and workplace)

In Japan, it has become clear that young people are facing difficulties in making a smooth transition from attending school to becoming a member of society and obtaining a job, as shown in the increase in the number of people employed as non-regular workers and the lack of progress in reducing the early job-leaving rate.

[Chart 4-1 Unemployment rate among young people and changes in rates of non-regular employment (by age group)]

*Unemployment rates are taken from the “Labour Force Survey,” Ministry of Internal Affairs and Communications (MIC) Statistics Bureau; rates of non-regular employment are taken from the “special survey of the Labour Force Survey” (February survey) and the “Labour Force Survey (survey results)” (January–March survey), MIC Statistics Bureau

[Chart 4-2 Changes in the Number of Unemployed Young People]

(Unit: 10,000 people)

*The unemployed young people as referred to herein are unemployed people who are aged between 15 and 34 and neither perform domestic work nor are enrolled in school.

Source: “Labour Force Survey,” MIC Statistics Bureau
In recent years, the need for advanced knowledge and skills has grown. In addition, the industrial and employment structures are undergoing significant changes.

Amid the increasingly severe employment situation for young people, new graduates will have fewer opportunities to develop their vocational capabilities once they have become non-regular workers or if they have proceeded to higher education or remain unemployed. As a result, new graduates will remain trapped in a long period of uncertainty.

In-house education and training based on the premise of long-term employment is also a notable feature of the employment practice in Japan. However, more than 70% of companies also acknowledge the challenge they face in human resource development, citing a lack of training instructors and time. Meanwhile, as non-regular workers have limited opportunity for in-company education and training compared with regular workers, they face difficulty improving their skills through their jobs.

*The above figures represent those for students that graduated in March of each year
Source: MHLW "Survey on Job Separation among New Graduates

(Background (1) Change in the industrial and employment structures)
The rate of enrollment in senior high schools has risen to about 98% and the rate of enrollment in higher education institutions has climbed to about 78%. As a result of the increased school enrollment, it has become a challenge to consider how education should meet the diverse learning needs of students.

Senior high schools have served as the driving force behind Japan’s social development; the annual number of graduates from such schools who obtained jobs used to exceed the number of higher education graduates who did so. In particular, specialized vocational high schools have played a significant role in the development of human resources that support the development of Japan’s monodzukuri industry by providing practical training closely related to work.

Universities are intended to contribute to the development of society as the centers of academic studies by fostering a high level of intellectual capacity and expert skills, pursuing truth, creating new knowledge and spreading the results thus achieved throughout society.

Colleges of technology, which provide five-year courses that feature specialized education programs centering on experiments and practical training are appreciated for their fostering of technical workers with practical skills and creativity.

Specialized training colleges foster personnel with sufficient skills to become “monodzukuri” experts by taking advantage of their institutional flexibility to provide a diverse range of vocational training in response to social needs.
[Chart 4-7 Status at Industry-related Courses (senior high schools)]

<table>
<thead>
<tr>
<th></th>
<th>FY04</th>
<th>FY05</th>
<th>FY06</th>
<th>FY07</th>
<th>FY08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of graduates</td>
<td>102,722</td>
<td>97,232</td>
<td>93,901</td>
<td>88,431</td>
<td>85,244</td>
</tr>
<tr>
<td>Number of employed graduates</td>
<td>55,492</td>
<td>55,960</td>
<td>56,415</td>
<td>55,426</td>
<td>53,562</td>
</tr>
<tr>
<td>Ratio of employed graduates</td>
<td>54.0%</td>
<td>57.6%</td>
<td>60.1%</td>
<td>62.7%</td>
<td>62.8%</td>
</tr>
<tr>
<td>Successful job search rate</td>
<td>96.4%</td>
<td>97.3%</td>
<td>97.5%</td>
<td>98.2%</td>
<td>98.0%</td>
</tr>
<tr>
<td>Number employed in manufacturing industries</td>
<td>32,021</td>
<td>33,413</td>
<td>34,877</td>
<td>34,035</td>
<td>33,539</td>
</tr>
<tr>
<td>Ratio of graduates engaged in manufacturing industries</td>
<td>57.7%</td>
<td>59.7%</td>
<td>61.8%</td>
<td>61.4%</td>
<td>62.6%</td>
</tr>
<tr>
<td>Number of graduates employed for production processes and labor work</td>
<td>40,358</td>
<td>41,419</td>
<td>42,044</td>
<td>41,750</td>
<td>40,337</td>
</tr>
<tr>
<td>Ratio of graduates engaged in production processes and labor work</td>
<td>72.7%</td>
<td>74.0%</td>
<td>74.5%</td>
<td>75.3%</td>
<td>75.3%</td>
</tr>
<tr>
<td>Job opening to applicant ratio</td>
<td>3.7</td>
<td>4.6</td>
<td>5.3</td>
<td>6.8</td>
<td>6.8</td>
</tr>
</tbody>
</table>

Source: MEXT, “Basic Survey of Schools” (Job opening to application ratios are figures based on a survey by the National Association of Principals of Technical Senior High Schools)

[Chart 4-8 Status at Engineering-related Departments (universities)]

<table>
<thead>
<tr>
<th></th>
<th>FY04</th>
<th>FY05</th>
<th>FY06</th>
<th>FY07</th>
<th>FY08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of graduates</td>
<td>97,931</td>
<td>96,675</td>
<td>96,153</td>
<td>95,216</td>
<td>93,684</td>
</tr>
<tr>
<td>Number of employed graduates</td>
<td>54,496</td>
<td>56,274</td>
<td>57,708</td>
<td>57,841</td>
<td>54,578</td>
</tr>
<tr>
<td>Ratio of employed graduates</td>
<td>55.6%</td>
<td>58.2%</td>
<td>60.0%</td>
<td>60.7%</td>
<td>58.3%</td>
</tr>
<tr>
<td>Number of graduates employed in manufacturing industries</td>
<td>18,151</td>
<td>19,339</td>
<td>20,175</td>
<td>20,511</td>
<td>19,811</td>
</tr>
<tr>
<td>Ratio of graduates employed in manufacturing industries</td>
<td>33.3%</td>
<td>34.4%</td>
<td>35.0%</td>
<td>35.5%</td>
<td>36.3%</td>
</tr>
<tr>
<td>Number of graduates engaging in specialized and technical jobs</td>
<td>40,838</td>
<td>42,715</td>
<td>44,694</td>
<td>45,289</td>
<td>43,457</td>
</tr>
<tr>
<td>Ratio of graduates engaging in specialized and technical jobs</td>
<td>74.9%</td>
<td>75.9%</td>
<td>77.4%</td>
<td>78.3%</td>
<td>79.6%</td>
</tr>
</tbody>
</table>

Source: MEXT, “Basic Survey of Schools

[Chart 4-9 Status at Colleges of Technology]

<table>
<thead>
<tr>
<th></th>
<th>FY04</th>
<th>FY05</th>
<th>FY06</th>
<th>FY07</th>
<th>FY08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of graduates</td>
<td>10,061</td>
<td>10,140</td>
<td>10,207</td>
<td>10,160</td>
<td>10,474</td>
</tr>
<tr>
<td>Number of employed graduates</td>
<td>5,415</td>
<td>5,457</td>
<td>5,546</td>
<td>5,502</td>
<td>5,610</td>
</tr>
<tr>
<td>Ratio of employed graduates</td>
<td>53.8%</td>
<td>53.8%</td>
<td>54.3%</td>
<td>54.1%</td>
<td>53.6%</td>
</tr>
<tr>
<td>Successful job search rate</td>
<td>97.7%</td>
<td>98.7%</td>
<td>98.7%</td>
<td>99.4%</td>
<td>99.2%</td>
</tr>
<tr>
<td>Number of graduates employed in manufacturing industries</td>
<td>2,844</td>
<td>2,986</td>
<td>3,097</td>
<td>3,081</td>
<td>3,207</td>
</tr>
<tr>
<td>Ratio of graduates employed in manufacturing industries</td>
<td>52.5%</td>
<td>54.7%</td>
<td>55.8%</td>
<td>56.0%</td>
<td>57.2%</td>
</tr>
<tr>
<td>Number of graduates engaging in specialized and technical jobs</td>
<td>4,887</td>
<td>4,935</td>
<td>5,036</td>
<td>5,077</td>
<td>5,171</td>
</tr>
<tr>
<td>Ratio of graduates engaging in specialized and technical jobs</td>
<td>90.2%</td>
<td>90.4%</td>
<td>90.8%</td>
<td>92.3%</td>
<td>92.2%</td>
</tr>
<tr>
<td>Job opening to applicant ratio</td>
<td>12.5</td>
<td>15.6</td>
<td>20.1</td>
<td>23.8</td>
<td>24.1</td>
</tr>
</tbody>
</table>

Source: MEXT, “Basic Survey of Schools”

(Background (3) Social awareness about vocational education)

Lack of awareness about vocational education has been pointed out as a problem for the entire society. Although social awareness about vocational education does not change rapidly, in light of the circumstances in which today’s children and young people find themselves, it is necessary to raise awareness about vocational education throughout society.
As a problem related to the maturity of children and young people, it has been pointed out that they lack interest in, motivation about, and commitment to work as well as a sense of purpose and responsibility and that the level of basic skills necessary for them to become professionals, such as communications ability, interpersonal relationship skills and basic social manners, has declined.

It has also been pointed out that in line with an increase in the ratio of people enrolled in higher education institutions, young people have grown increasingly inclined to postpone the selection and decision of their future course of life and career and that there are increasing numbers of people who do not try to advance to higher education or find a job and of those who advance to higher education without a clear idea of their future career patch or a clear sense of purpose.

The current difficulty in the situation from attending school to becoming a member of society and obtaining a job is due to the creating of uncertainty about the future in the eyes of children and young people, fueling worry among them. This also affects their interest in and motivation about learning at school and prevents them from adequately forming the habit of learning at school.

In addition, it may be necessary for schools to provide support to unemployed young people, such as students who failed to smoothly transition from attending school to becoming a member of society and obtaining a job. In order to support such people, various organizations will need to cooperate with each other, and it will be necessary to consider what kind role schools can play in this respect.

[Chart 4-10 Capabilities Especially Valued in Employment Selection of New Graduates]

<table>
<thead>
<tr>
<th>University graduates</th>
<th>Graduate school graduates</th>
<th>Junior college graduates</th>
<th>Specialized college graduates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Eagerness/motivation</td>
<td>77.2%</td>
<td>70.5%</td>
<td>78.6%</td>
</tr>
<tr>
<td>2. Ability to act/implement</td>
<td>49.5%</td>
<td>45.3%</td>
<td>59.3%</td>
</tr>
<tr>
<td>3. Spirit of cooperation</td>
<td>43.4%</td>
<td>38.2%</td>
<td>38.6%</td>
</tr>
<tr>
<td>4. Logical thinking</td>
<td>21.7%</td>
<td>28.0%</td>
<td>17.2%</td>
</tr>
<tr>
<td>5. Problem-solving ability</td>
<td>18.1%</td>
<td>23.6%</td>
<td>16.6%</td>
</tr>
</tbody>
</table>

Source: Japan Association of Corporate Executives, “Questionnaire Survey on Corporate Employment and Education” (May 2008)

[Chart 4-11 Cause of Worry When Deciding Career Course (broken down by when consciousness about work emerged)]

[Chart 4-12 Reasons for going to university (depending on the time when consideration was given to future occupation)]

Students’ failure to smoothly transition from attending school to becoming a member of society and obtaining a job is due to a structural problem involving a complex set of factors, including changes in the circumstances surrounding schools, society, children and young people, and those in their own attitudes. With this as a premise, it is necessary to sort out challenges related to school education.

Regarding senior high schools, many challenges have arisen particularly in ordinary courses, which have been increasing. Students wishing to advance to higher education, most of whom are enrolled in ordinary courses, have a strong tendency to postpone the selection and decision of their future course of life and career. In addition, there is a recent trend that students enrolled in ordinary courses face a difficult employment situation compared with those enrolled in other courses. Various surveys have shown that education provided in ordinary courses tends to have little relevance to society and work.

Now that the rate of enrollment in higher education institutions has almost reached 80%, there are diverse types of students. There are challenges from the perspective of career formation as some students enroll without an adequate awareness about their future social and working life.

Meanwhile, some workers wish to study at school in order to acquire necessary knowledge and skills. To meet such needs, schools will need to expand the learning opportunity for workers.

[Chart 4-13 Motives for entering high school (by course type) ]

Source: Japanese Association for Study of Career Guidance, “Comprehensive Survey on Actual Circumstances concerning Career Guidance at Junior and Senior High Schools” (commissioned by MEXT)
In the field of monodzukuri, too, it is important to promote social and vocational independence for young people by developing human resources in light of the employment situation and the need for human resources in individual business sectors. In order to develop a diverse range of human resources suited to monodzukuri, it is important to develop human resources in ways to make good use of the respective resources of individual schools; for example, some schools may continuously train personnel for production processes and labor work who engage in such work as the production of components and the assembly of finished products, while others foster engineers with expert skills who can adapt to advanced technology.

In the development of human resources suited to monodzukuri, the challenge is to motivate students to proactively acquire, through school education, a wide range of knowledge and skills and the ability to perform various tasks by using them and, on the other hand, to foster, through in-company and external lessons and training, personnel equipped with advanced knowledge and skills suitable for their respective jobs based on basic capabilities necessary for achieving social and vocational independence.

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![Chart 4-14 Active Job Opening to Applicant Ratio in the Manufacturing Sector](chart)

**Active job opening to applicant ratio**

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialized/technical jobs (*)</td>
<td>1.79</td>
<td>2.30</td>
<td>2.60</td>
<td>2.28</td>
<td>1.70</td>
<td>0.59</td>
</tr>
<tr>
<td>Production processes /labor work (*)</td>
<td>1.30</td>
<td>1.39</td>
<td>1.59</td>
<td>1.46</td>
<td>1.00</td>
<td>0.24</td>
</tr>
</tbody>
</table>

*The above data concern jobs related closely to monodzukuri.

Source: MHLW, “Statistics on Job Security”

![Chart 4-15 Domestic Procurement Ratio of Parts and Materials](chart)

At elementary and junior and senior high schools, carefully-planned and systematic initiatives are under way to enable students to proactively choose their career course in accordance with the new Courses of Study. In particular, vocational experience programs are implemented especially at junior high schools. In fiscal 2008, 96.5% of all public junior high schools implemented such programs. Vocational experience provides students with a rare opportunity for interaction with adults other than their parents and teachers, and it is expected to have very significant educational benefits, such as improving communications skills, enhancing capability to proactively choose a job, fostering strong job consciousness and stimulating motivation for learning.

As part of the initiatives related to monodzukuri, elementary schools seek to develop students' formative ability by encouraging them to make expressions with the full use of the functions of their hands and other body parts in such subjects as Science, and Art and Handicraft. Junior high schools have students acquire basic knowledge and skills related to monodzukuri through practical and experience-based lessons in the subject of Industrial Arts and Home Making. At the same time, junior high schools provide guidance related to monodzukuri as necessary in the science subject and attach increased importance to lessons that encourage students to express their feelings and ideas with the use of materials and tools in the Fine Arts subject. In addition, elementary and junior and senior high schools are promoting experience-based lessons related to monodzukuri in the Period for Integrated Studies as part of educational activity that takes advantage of individual schools' creative and resourceful ideas.

**[Career Education Centering on Understanding of and Contributions to the Local Community]**

Fushimi Junior High School in Kyoto provide experience programs in each grade in accordance with the level of students' maturity.

In the first grade, students, divided into groups, visit local companies and interview company officials and publish newspapers carrying articles that summarize such matters as the contents of the companies' businesses and top managers' thinking.

In the second grade, students look for companies willing to provide them with vocational experience and complete a five-day experience program.

In the third grade, student groups present plans for activities and events based on their experiences in the first and second grades. The plans so far presented include those for a year-end sales campaign event intended to invigorate a local shopping street and product development and public relations activities related to such local products as *arame* seaweed and the *kyo-gawara* tile.

The experience programs help students better understand local industries and traditional cultures that support their life and improve their communications and information-gathering skills.
Wazuka Junior High School in Wazuka Town has provided students with experience in producing tea (Wazuka tea) in the Period for Integrated Studies subject so as to encourage them to love and take pride in their home town.

In the first grade, students learn about the traditional way of tea production and study the history and culture of tea. In the second grade, they learn about the current system of tea trade, including the distribution system, while engaging in the production of tea. In the third grade, they reflect on the future of Wazuka tea and consider their future course of life in relation to the future of Wazuka tea and Wazuka Town.

As children participate in local production activity and local people support their learning, children learn from the lives of local neighbors and reflect on their own future.

The Industrial Arts and Home Making subject at junior high schools is intended to have students acquire basic knowledge and skills related to materials processing, energy conversion, information processing, clothing and cooking through monodzukuri lessons, and to develop the ability and readiness to use such knowledge and skills to enrich their lives with their creative and resourceful ideas.

By making bookends, robots and bags and cooking light meals themselves, students feel the pleasure of work and the delight of accomplishing a task and recognize anew the admirable skills of people who engage in jobs related to their lessons. In addition, they acquire the important traits that support monodzukuri, such as dedication to preciseness, patience, sensibility about beauty, and teamwork, as well as the traditional Japanese spirit of “mottainai,” which leads to the establishment of a sustainable society.

In the 10th “National Junior High School Education Fair for Creative Monodzukuri,” students who had survived the regional qualifying rounds across Japan fully demonstrated their remarkable skills.
Ordinary courses at senior high schools are implementing initiatives that take account of students' future career prospects, such as inviting company officials in charge of personnel management and people with expert knowledge and experience. Internship programs have also become widespread, with 57.3% of ordinary courses (full-day courses) of public senior high schools implementing such programs in fiscal 2008.

Since fiscal 2007, surveys and studies have been under way on how to enhance career education and how to utilize personnel with expert knowledge concerning career education in ordinary courses of senior high schools research through the “Survey Research on the Desirable Status of Career Education at Senior High Schools”.

In relation to monodzukuri-related initiatives, the government is promoting experience-based learning in the Crafts Production programs of the Art subject and the Period for Integrated Studies as part of educational activities that take advantage of individual schools’ resourceful ideas.

(2) Initiatives in specialized courses

MEXT is promoting the "Become a Specialist (super specialized senior high schools)" project, which provides support to unique education programs implemented by specialized high schools in collaboration with universities and research institutions to enable the acquisition of advanced techniques and skills, such as research programs related to new monodzukuri education (32 schools were designated as super specialized senior high schools in fiscal 2009).

In addition, MEXT, together with METI, is implementing the project to foster personnel that support local industries, which aims to develop human resource development programs comprising long-term practical training of students at companies, practical lessons given by corporate engineers at schools and joint research activity between schools and companies (a total of 56 areas were designated for the implementation of this project in fiscal 2009).

Moreover, specialized high schools are implementing various distinctive initiatives in cooperation with local industries, such as introducing unique subjects and courses, including an “industrial Meister” course and a disaster prevention/mitigation engineering course.

(3) Initiatives in integrated courses

Integrated courses have introduced clusters of interconnected optional subjects (field-specific and comprehensive clusters of optional subjects) so as to enable students to engage in coherent learning and study subjects related to their future career course. Individual schools have established various types of subject clusters that reflect the unique characteristics of local industries as well as the schools’ unique features. Subject clusters related to monodzukuri include engineering and mechatronics clusters, which comprise industry-related specialized subjects.

In addition, in order to raise students’ awareness about their future career course and enable them to acquire knowledge and skills that form the basis of their future vocational life, integrated courses have introduced the industrial society and human beings subject, which should in principle be studied by all students. This subject comprises various educational activities, such as lectures and speeches by professionals, visits to companies and inspection of higher schools to which students aim for.

[Project to Foster Personnel that Support Local Industries]

This project has been implemented jointly by MEXT and METI since fiscal 2007 so as to enable technical high schools to cooperate in developing human resources that support local monodzukuri industries. At prefectural and municipal technical high schools in 29 regions across Japan, there are ongoing projects in which students are trained under internships at local companies or under the Dual Training System for about 20 days in order to acquire professional skills, and there are projects in which students receive instructions directly from skilled company workers.
Enhancement of Science and Technology and Science and Mathematics Education

Now that global competition in the science and technology field has grown more intense than ever and the benefits of science and technology are utilized in every corner of society, it is an urgent challenge to enhance science and mathematics education, which forms the basis of science and technology.

In the Science subject under the new Courses of Study, MEXT has taken such improvement measures as enhancing the contents of study programs and securing sufficient time for observation and experiment programs, writing of reports and nature experience from the viewpoint of developing students’ ability to adapt to international activity and promoting a smooth transition from elementary to junior and senior high schools.

In addition, MEXT is seeking to increase students’ motivation for learning and fostering an inquiring mind in the context of science and technology in real society through such initiatives as the “Super Science High School (SSH)” project, which implements advanced science and mathematics education, and the “Science Partnership” project, which supports learning programs implemented by high schools in cooperation with universities and research institutions. Moreover, MEXT is improving science education facilities, including equipment used at schools for observation and experiments, in a systematic manner in accordance with the Science Education Promotion Act.

[Super Science High School (SSH) Project]

Fukushima Senior High School in Fukushima Prefecture has established a science exploration class, which provides lectures and experiment lessons in school-designated subjects, such as “SSH Exploration,” and which allows students to conduct guided research in the fields of their own interest.

As part of guided research activity, the physics and structural mechanics team is tackling the research theme of making a mock-up bridge comprised of light materials which can bear the weight of people. In preparation for the drafting of a blueprint of the bridge, the team conducted a weight-loading experiment using a simulation software program and calculated the strength of the force that is applied to each section of the bridge.
Schools for special needs education provide guidance related to career education and vocational education to students with visual impairment, hearing impairment or intellectual disability, as well as students with physical disability or health impairment, in a similar way to elementary and junior and senior high schools while taking special care in accordance with the type and level of disabilities of individual students.

For example, students with intellectual disabilities are trained so as to develop a readiness to participate in society on their own by improving knowledge and skills necessary for workers and fostering the concept of work and occupation through monodzukuri-related experienced-based programs and practical lessons in the workplace that are provided in collaboration with local communities and local industries, mainly in the “occupation/home economics” subject at the junior high school level and the “occupation” subject at the senior high school level.

In addition, in such subjects as “integrated studies” and “special activity,” individual schools are implementing initiatives related to vocational education and career education as part of educational activities that take advantage of their own resourceful ideas.

Moreover, the Courses of Study for schools for special needs education, which were revised in March 2009, (1) have established a new subject specialized on “welfare” for schools for students with intellectual disabilities and (2) prescribes that schools for special needs education should actively provide opportunities of work experience in cooperation with local communities and industries and labor-related organizations so as to enhance the vocational education with a view to enabling such students to achieve independence and social participation.

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(Career and Vocational Education at Schools for Special Needs Schools)

(School for Special Needs Education in Osaka Prefecture, named “Tamagawa Koto Shien Gakko”)

The School for Special Needs Education, named “Tamagawa Koto Shien Gakko,” comprises only an upper secondary school department and focuses on vocational education, with the educational goal of “developing mental richness and fostering students who seek to achieve social independence by being engaged in a job.”

This school provides a monodzukuri course (the industrial foundation and food production fields), a welfare and gardening course (the welfare fields and gardening fields) and a distribution service course (the backyard services and office services fields). Among its 30 study hours per week, 11 are allotted to specialized subjects of individual courses and two are allotted to the common subjects of cleaning and sales.

In the industrial foundation field of the monodzukuri course, students manufacture various goods, including bulletin boards and bookends, in practical training concerning woodwork and metalwork. In the food production field, students make cookies, buns, jams and miso paste using the same cooking instruments as the ones used at stores.

Through initiatives like the ones above, this school seeks to enable students to acquire professional knowledge and skills and foster the recognition of work and occupation.
Colleges of technology foster monodzukuri engineers with practical skills and creativity through a five-year course starting after graduation from junior high school. As colleges of technology have a good reputation, the application-to-enrollment ratio reached 1.8 in 2009 and the job opening-to-applicant ratio for their graduates in the same year stood at 24.1.

The education curriculum of colleges of technology is designed so as to smoothly combine general education and specialized education, such as experience-based programs like experiments and practical training and internship programs.

Meanwhile, two national colleges of technology in each of four regions – Miyagi, Toyama, Kagawa and Kumamoto – underwent restructuring, including reorganization and enhancement of specialized courses, in order to diversify the range of subjects available while maintaining economies of scale, and to achieve higher levels of science and technology and strengthen industry-academia collaboration in response to the advance of science and technology.

### Long-Term Internship for College of Technology Students

Ishikawa National College of Technology is dispatching a total of 112 students over a four-year period to companies for a three-month internship.

About 80% of the host companies are locally-based ones in a diverse range of business sectors. During the three months of the internship, students tackle practical tasks, such as learning production technology, collecting test data, developing software programs and integrating work. In some cases, students contributed to practical work, for example by conducting a functional evaluation of carbide alloy and even publishing the results at an academic convention and by developing an image recognition software program. The internship program enables the college to foster students with a comprehensive set of skills acquired through their cooperation with corporate engineers, while companies expect the internship to invigorate the workplace with the creativity of students.

### Competition of Ideas: The Robot Contest between National Colleges of Technology from Across Japan (Robocon)

This is a nationwide annual educational event that has been held since 1988, in which students from colleges of technology compete with each other in ideas and technology, and which provides the opportunity for them to experience the fun of making robots based on their own ideas and with their own hands and to recognize the importance of coming up with new ideas and share the delight of monodzukuri.

In the 22nd contest held in 2009 with the theme “Dancin’ Couple,” each team demonstrated a collaborative performance of two robots. About 4,000 people visited Ryogoku Kokugikan to watch the contest, cheering the robot performance incorporating unique ideas and technology developed by the 25 teams of students who had survived the regional qualifying rounds.
The Washington palm tree, which is planted widely in the southern Kyushu region, provides scenery typical of a tropical country. However, withered branches hanging from the tree undermine the landscape, and if left unattended, could injure people or cause property damage when they fall off. Therefore, the tall tree requires periodic pruning work, which is a dangerous operation due to the height involved.

Kagoshima National College of Technology won the top award in a student venture business contest organized by the Kagoshima Industry Support Center and co-developed a pruning robot with four local companies. This robot eliminates the need for a special vehicle for high-altitude operation and enables a small group of workers to complete the pruning work in a short period of time.
Specialized training colleges, intended to foster professionals who support local industries, are implementing initiatives to improve practical expert knowledge and skills in cooperation with local industries in the field of monodzukuri.

MEXT is promoting the development of monodzukuri human resources by using specialized training colleges to provide young people and others who quit jobs early in their working career with learning opportunities and by implementing the “Plan to Provide Intensive Support to Education at Specialized Training Colleges,” which conducts intensive research and development activity at designated schools with regard to education programs suited to the development of human resources for local industries and in new fields.

In addition, MEXT, in cooperation with senior high schools, is continuing to implement the “The Vocational Education Promotion Plan to incorporate Specialized Training Colleges and Senior High Schools,” which explains to senior high school students example cases of knowledge, skills and qualifications necessary for obtaining a job and which provides opportunities for career education such as vocational experience lessons.

### Examples of Initiatives at Specialized Training Colleges

- **Hokkaido High-Technology College (prosthetist and orthotist course)**
  Prosthetists and orthotists are professionals who contribute to collaborative medical care with doctors and physical therapists by making and adjusting prosthetics and orthotics and fitting them to patients. Prosthetists and orthotists are required to acquire the skills not only to make prosthetics and orthotics but also to provide mental care for patients suffering from the grief of losing limbs due to accidents and diseases. For a long time, Hokkaido has been inconvenienced by the absence of training schools for prosthetists and orthotists, and there have been requests from patients, makers of prosthetics and orthotics and young people aspiring to become prosthetists and orthotists for local training of such personnel. The prosthetists and orthotists course, which opened in 2006 in response to such requests, seeks to foster prosthetists and orthotists who have expert skills and who can empathize with patients.

- **NAGOYA KOUGAKUIN COLLEGE (robotics creative course)**
  Many industrial robots are involved in the process of automobile production, and engineers in charge of production and maintenance of robots are required to have not only technical and human relationship skills but also the ability to adapt to new technologies. The robotics creative course of Nagoya Kougakuin College is promoting the development of human resources that contribute to the promotion of local industries and meet the needs of local companies by holding various robot-related events and implementing a long-term internship program while maintaining cooperation with the New Industrial Division of the Aichi Prefectural Government’s Department of Industry and Labor. and local companies.
In response to the need for the creation of universities with unique characteristics and the strengthening of international competitiveness, it is important to improve the quality of university education and develop human resources capable of playing an active role across national borders.

Therefore, in order to systematize education programs at universities, ensure the quality of and the international applicability of education programs, the targets for the effects and achievements of learning and the core curriculum are being considered and drawn up by a panel of experts.

Regarding the field of engineering in particular, in order to further enhance the training of technical workers, the panel of experts on practical training of technical workers was established, and the panel is considering measures to develop capabilities necessary for technical workers and ensure their quality. MEXT is also implementing the “Project to Develop Human Resources with Practical Skills through Industry-Academia Collaboration: Fostering of Monodzukuri Technical Workers,” which is intended to foster engineers with advanced knowledge and skills that may bring innovation to the field of monodzukuri through the joint development and implementation of education programs by universities and local communities and industries.

Meanwhile, in an increasing number of cases, universities and colleges of technology are using the accreditation system for education of technical workers. Under this accreditation system, the Japanese Accreditation Board for Engineering Education (JABEE) grants accreditation to technical worker education programs implemented by universities and other institutions. By fiscal 2008, accreditation was granted to 413 education programs.

[Chart 4-16 Status of Accreditation of Education Programs for Technical Workers]

<table>
<thead>
<tr>
<th>Universities</th>
<th>Master’s degree courses (including 1st stage doctoral courses)</th>
<th>Undergraduate courses</th>
<th>Colleges of technology</th>
<th>Academies with quasi-university status</th>
<th>Total</th>
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<td>FY08</td>
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<td>Total</td>
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In this initiative, Kyoto Institute of Technology, Kyoto Shisaku Net (group of small and medium-size processing companies) and product developing companies that represent the Keihan region collaborate closely with each other in developing a follow-up type internship program by organically combining problem solving, practical design training, internship and lectures. This internship program would enable students to have first-hand experience of the actual monodzukuri process leading up to the realization of their own product design in the form of a finished product, thereby fostering personnel with creativity and a critical mind and capable of looking at the monodzukuri process from a multi-faceted, broad perspective.

In the “practice of monodzukuri based on Industry-academia collaboration,” which is the mainstay subject of this initiative, the education program is designed so as to enable students to study the whole of the monodzukuri process, from the beginning to the end, in a comprehensive manner.

This project was implemented in order to enable students to absorb what they learned in lectures and experiments in ways directly linked to the needs of companies by sending them to a “monodzukuri skills transfer center” operated by retired skilled technical workers so that they can acquire practical skills that are not available through university education; with the support of corporate technical workers, university staff and advisors, students were recognized as having fully mastered the skills engaged in research and development of technologies and products required by companies.

This project is expected to help pass the sophisticated monodzukuri skills of retired technical workers to new generations and lead to the development of new technologies and products based on those skills.
(1) Management of the professional engineer system
The professional engineer system was established under the Professional Engineer Act, which was enacted in 1957. This system is intended to maintain the appropriateness of business processes such as planning, research, designing, analysis and testing concerning matters that require advanced expert application capability related to science and technology, by granting professional engineer qualification to personnel engaging in such business processes, thereby contributing to the advancement of science and technology and the development of the national economy. People who want to become a professional engineer must pass a national examination in individual technology fields, such as Mechanical Engineering and Civil Engineering, and get registered. As of the end of December 2009, 66,643 people were registered as professional engineers and 23,809 people as associate professional engineers.

(2) Continuing professional development for engineers
MEXT provides Web-based self-education materials and a failure knowledge database in the field of science and technologies. The education materials and the database assist engineers in learning broad and basic knowledge including failure case examples. At the end of January 2010, 819 self-education lessons and 1,167 failure case examples were uploaded on the websites.

[Chart 4-17  Proportion of Professional Engineers in Technical Fields]

Source: Survey by MEXT (as of the end of December 2009)
As it has become an urgent challenge to enhance career education and vocational education, the Minister of Education, Culture, Sports, Science and Technology asked the Central Council for Education in December 2008 to deliberate how career education and vocational education should be implemented at schools in the future.

In response, the council’s special subcommittee on career education and vocational education first debated this matter with a focus on upper secondary education and higher education, which represent the final stage in the transition to becoming a member of society and obtaining a job, and it drew up a progress report on the deliberation of this matter in July 2009.

This report made the following recommendations regarding the basic future direction of career education and vocational education.

(1) In order to have students acquire capabilities necessary for achieving social and vocational independence in a systematic manner in compulsory education through higher education, education programs should be improved and enhanced with priority placed on students’ relationship with society and work from the viewpoint of career education.

(2) The significance of vocational education, which plays an important role in the prosperity of Japan, should be re-evaluated, and vocational education should be improved in a systematic manner and should focus more on practical training.

(3) Support for career formation should be enhanced from the viewpoint of lifetime learning so as to enable people to improve their vocational capabilities by acquiring necessary knowledge and skills or conducting an in-depth study whenever they like.

Since drawing up the progress report, the special subcommittee has held hearings with relevant organizations and, at the education stage, while taking account of the results of the hearings, it conducted further deliberation on such issues as social and vocational independence, capabilities necessary for smooth transition from attending school to becoming a member of society and obtaining a job.

Meanwhile, the working group on universities, which is deliberating the desirable status of university education from the medium- and long-term perspective, drew up a progress report on its deliberation in January 2010. The report pointed out that it would be appropriate to establish a rule requiring the development of a proper system for the provision of guidance related to social and vocational independence by seeking organic collaboration between various organizations within universities so as to enable students to improve their own qualifications after graduation and acquire capabilities necessary for achieving social and vocational independence through the implementation of educational programs, welfare and guidance. In response, the standards for the establishment of universities and junior colleges were revised in February 2010 to include a provision to the above effect.
Section 2 Promotion of R&D to enhance industrial capabilities

1 R&D of basic monodzukuri technologies

“Monodzukuri technologies” contribute not only to the enhancement of international competitiveness but also to improvements in the standard of living and resolution of problems related to the people’s lives, including safety and security, by creating new added-value for products and processes. In order to spur innovation based on “monodzukuri,” it will be important to continue pursuing R&D concerning value-creating basic manufacturing infrastructures by promoting R&D on advanced measurement and analysis technologies, and equipment, and on very precise simulation technology, as well as by developing and utilizing the most advanced, large-scale R&D infrastructures.

[Column: Development of Single Particle Analyzer]
A team led by Professor Masaaki Fujii at the Chemical Resources Laboratory of Tokyo Institute of Technology is developing a solid substance analyzer with the world’s highest level of spatial resolution in the Project to Develop Advanced Measurement and Analysis Technology and Equipment. This analyzer is expected to contribute to the fight against environmental pollution by enabling analysis of toxic substances generated by factories and to the development of new materials using nano-level control.

[Column: Nursing Care Robot “RIBA”]
RIKEN-TRI Collaboration Center for Human-Interactive Robot Research, which was established by RIKEN and Tokai Rubber Industries, Ltd., proceeded with research on “RIBA,” a nursing-care assistant robot, in a research program concerning the motion control functions peculiar to animals. This robot can contribute to nursing and welfare activities as it can perform the processes of picking a human being up from a bed or a wheelchair, moving him/her to a different location and putting him/her down.

[Column: Support for Nanotechnology Research through the Nanotechnology Network Project]
The Nanotechnology Network project promotes cross-sectoral research in a strategic and efficient manner by providing researchers with opportunities to use cutting-edge nanotechnology research facilities owned by universities and incorporated administrative agencies across Japan, as well as advanced technologies and knowledge. In one recent example of an achievement in this project, a resin coil structure manufactured with the use of the fine-processing support program contributed to the development of a prototype generator using the low-frequency vibration energy found in the natural environment. This generator is expected to replace the button cell battery. Thus, the Nanotechnology Network is helping to open up a new path of “monodzukuri.”
2 Promotion of R&D based on industry-academia collaboration

(Joint R&D by universities and companies and R&D for technology transfer)

In order to promote cooperation between universities and the private sector, the Japan Science and Technology Agency runs the Adaptable and Seamless Technology Transfer Program through Target-Driven R&D (A-STEP). This program promotes “seamless” implementation of research and development while setting optimum funding plans for activities such as: “seeds exploration,” which assesses commercial viability with a view to commercializing promising research results achieved by universities; joint research projects with the private sector for commercialization; and university-derived venture businesses, in accordance with the specific nature of the needs and challenges involved in these activities.

In addition, there is a special tax measure that allows the deduction, from corporate and income tax statements, of a certain proportion of research expenses for joint experimental research by private companies and universities.

[Chart 4-18 Number of Joint Research Programs Undertaken by National, Public and Private Universities and Private Companies]

[Number of Research Programs Commissioned by Private Companies to National, Public and Private Universities]

[Chart 4-20 Number of Permits for Patent Implementation]
The creation of “knowledge clusters” is being promoted under regional initiatives. Knowledge clusters conduct R&D activities with core universities and other public research institutions in order to meet the needs of companies, and they seek to attract human resources, information, and investment from other regions and foreign countries by taking advantage of the results of R&D to advance regional industries, develop new products, and improve services.

Since fiscal 2002, MEXT has been implementing the “knowledge cluster initiative,” which promotes the creation of internationally competitive, world-class clusters, and the “City Area Program,” which is intended to create clusters that may be small but have strengths based on unique local features. Since fiscal 2001, METI has been supporting the establishment of industrial clusters in which small and medium-size local venture businesses form a network of personal connections with universities, research institutions and financial institutions and which launch new projects and create new industries one after another.

[Chart 4-21 Map of Knowledge Cluster Initiative in FY2009]

Source: Survey by MEXT

[Chart 4-22 Map of City Area Program in FY2009]

Source: Survey by MEXT

[Chart 4-23 Industrial Cluster Projects in FY2009]

Industrial Cluster Projects (18 projects across Japan)

First Term (2001-2005) ~Start-up Period ~
- Project to Create Manufacturing Industry in Tokai Region (Manufacturing fields)
- Tokai Bio - Factory Project (Biotechnology fields)
- Project to Create Manufacturing Industry in Hokuriku Region (Manufacturing and Biotechnology fields)

Second Term (2006-2010) ~Development Period ~
- Kyushu Recycle and Environmental Industry Plaza (Environmental fields)
- Kyushu Silicon Cluster Project (Environmental fields)
- Kyushu Bio Cluster Project (Biotechnology fields)

Third Term (2011-2020) ~Sustainable Development Period ~
- Shikoku Techno Bridge Plan (Manufacturing and health/biotechnology fields)
- Shikoku Bio Cluster Project (Biotechnology fields)
- Shikoku Recycle and Environmental Industry Plaza (Environmental fields)
- Kyushu Silicon Cluster Project (Environmental fields)
- Kyushu Bio Cluster Project (Biotechnology fields)

Source: Survey by MEXT
In order to promote the transfer of research results from universities to private companies so as to ensure that they lead to innovation in an effective manner, MEXT started the project for strategic development of industry-university-government collaboration in fiscal 2008. In this project, MEXT is strengthening systems for the strategic creation, management and use of research results (support for the acquisition of basic patent rights abroad and the establishment of a system for using intellectual properties through inter-university collaboration) and is supporting universities involved in industry-academia-government collaborative activities (promotion of the return of research results to industries and local communities) through its industry-academia-government collaboration coordinators.

In addition, in light of the results of the review of projects by the Government Revitalization Unit in fiscal 2009, four projects, including the project for strategic development of industry-university-government collaboration, were integrated in fiscal 2010 into the “project for developing innovation systems,” which is scheduled to be phased out by fiscal 2013. In addition, the project expenses have been reclassified from “commission expense” to “subsidy” so as to invigorate proactive initiatives by local communities and universities.

[Chart 4-24 Regional Distribution of Institutions Implementing “Project for Strategic Development of Industry-University-Government Collaboration”]
Part 2 Measures and Policies Implemented in Fiscal 2009 in Relation to the Promotion of Manufacturing Infrastructure Technology

1. Matters Related to Research and Development of Manufacturing Infrastructure Technology

Promotion of research and development relating to manufacturing infrastructure technology, etc.

(1) Adoption and Revision of the New Growth Strategy (Basic Policies)

The government adopted the New Growth Strategy (Basic Policies) upon a cabinet decision in April 2009. The Basic Policies designate six strategic areas: 1) environment and energy; 2) health (growth areas driven by Japan’s strengths) 3) Asia; 4) tourism and local revitalization (growth areas driven by pioneering new frontiers) 5) science and technology; 6) employment and human resources (platforms to support growth). In the area of science and technology, it is prescribed that innovation should be promoted.

(Green innovation (innovation in the environmental and energy sectors) and life innovation (innovation in the medical and nursing care sectors) are to be realized through the above initiative and are expected to greatly contribute to the further development of the Japanese manufacturing industry.)

(2) Tax system for promoting research and development (Estimated tax revenue decline: 254.0 billion yen (in fiscal 2009))

i) Tax credit system relating to the total amount of experiment and research costs*

A tax exemption equivalent to 8 to 10%** of the total amount of experiment and research costs (the upper limit set at 20% of the amount of the corporate taxes to be paid for the relevant fiscal year) will continue to be applicable, according to the research and experiment cost ratio (the ratio of experiment and research costs to the total sales).

ii) Tax system for strengthening SMEs’ technology infrastructures*

Regarding R&D activities conducted by SMEs, a tax exemption equivalent to 12% of the experiment and research costs (the upper limit set at 20% of the amount of corporate taxes to be paid for the relevant fiscal year) will continue to be applicable.

*Under the economic policy package of fiscal 2009, it was arranged that regarding the tax credit system relating to the total amount of experiment and research costs, (1) the upper limit on tax exemption would be raised from 20% of the amount of the corporate taxes to be paid for the relevant fiscal year to 30% and (2) the portion of the experiment and research costs in excess of the upper limit in fiscal 2009 and 2010 would be eligible for tax exemption in fiscal 2011 and 2012. (The above measures will remain in effect until the end of fiscal 2011.)

**The tax exemption ratio relating to special experiment and research costs is a figure obtained by subtracting the tax exemption rate relating to experiment and research costs from the rate of 12%.

iii) Tax deduction system relating to an increase in experiment and research costs

In addition to i) and ii) above, it was arranged as in the previous fiscal year that either a tax deduction system related to an increase in experiment and research costs or a tax deduction system related to the portion of the amount of experiment and research costs in excess of 10% of the average sales was applicable (the upper limit set at 10% of the amount of corporate taxes to be paid for the relevant fiscal year, separately from the upper limits concerning i) and ii) above.

(3) Formulation of a technology strategy map

Since the 2005 adoption of the first technology strategy map that takes into consideration future needs of society and the people and advances and other developments related to technologies, the government has been revising it annually to modify its contents and expand the range of fields covered. In April 2009, the technology strategy map 2009, which covers 30 fields, up from 29 in the previous year’s version, was announced.

(4) Steady promotion of programs for innovation (198.6 billion yen)

Under the following seven innovation programs, the government promoted R&D activities and measures necessary for the commercialization of the achievements of the activities (regulatory reforms, standardization, etc.) in a comprehensive manner and encouraged the creation of innovation through the promotion of S&T.

i) IT innovation program ii) Nanotech/materials and components innovation program
iii) Robot/new machinery innovation program iv) Energy innovation program
v) Environment and safety innovation program vi) Health and comfort innovation program vii) Aerospace innovation program
Promotion of research and development relating to manufacturing infrastructure technology

(5) Thorough management of trade secrets and thorough prevention of leakage of technology
The Unfair Competition Prevention Act was revised in April 2009 in order to prevent the outflow of business secrets owned by companies, including important technologies and know-how, and thereby maintain and strengthen the competitiveness of Japanese industry. As a result, illegal acquisition of business secrets has become subject to criminal penalty (the revised act is scheduled to be put into force on July 1, 2010). In response to this, explanatory meetings were held at 18 locations across Japan to widely communicate the contents of the revised Unfair Competition Prevention Act. In addition, the working group on the management of business secrets under the subcommittee on how to protect information technology of the Industrial Structure Council’s Intellectual Property Policy Committee held several rounds of debate from August 2009, and the working group worked out a proposal for the revision of the guideline for the management of business secrets in March 2010 in order to provide further support to efforts to ensure the appropriate management of business secrets that is a prerequisite for legal protection.

Collaboration between manufacturing businesses and universities, etc.

(1) Partnership between industry and academia for human resource development (1.511 billion yen)
Partnership between industry and academia for human resource development to create a positive growth cycle for collaboration between industry and academia for human resource development in Japan, known as the “Industry-Academia Partnership for Human Resource Development,” has been promoted by the Ministry of Education, Culture, Sports, Science and Technology and the Ministry of Economy, Trade and Industry since fiscal 2007 to provide opportunities for dialogue and actions relating to human resource development for both the academic and industrial circles. In fiscal 2009, “Direction of Future Measures (fiscal 2009)” was announced and specific measures were taken, including the development of human resource development model programs in various fields, through industry-academia collaboration and the development of a systematic method for fostering and evaluating students’ basic social skills.

(2) Career Gateway to Asia (3.4 billion yen)
In order to form a network with other Asian countries, promote the globalization of Japanese universities and companies, and strengthen the competitiveness of Japanese industry, since fiscal 2007, the government has been implementing the Career Gateway to Asia program, which promotes the development of advanced overseas human resources capable of contributing to Japanese industry by implementing projects to provide Asian students staying in Japan with specialized education, Japanese language education, corporate culture education, internships, and employment-support through industry-academia collaboration. In fiscal 2009, around 1,500 foreign students participated in the Career Gateway to Asia.

2. Matters Related to Securing Manufacturing Workers

Prevention of unemployment and other matters related to employment stability

(1) Maintenance and stabilization of employment through the subsidy for employment adjustments (660 billion yen)
In order to prevent unemployment and stabilize the employment situation in other ways in cases where companies are forced to reduce business activity for economic reasons such as economic cyclical changes and changes in the industrial structure, a subsidy for employment adjustments was provided to companies that strive to maintain employment by suspending business operations temporarily or sending employees on loan to other companies.
(1) Emergency fund for human resource development and employment support (tentative name) (a total of 346.6 billion yen* in fiscal 2009 and 2010)
While employment conditions continue to be harsh, there are concerns that non-regular workers who lost their jobs due to employment adjustments may face a prolonged period of unemployment. In light of this, an emergency fund for human resource development and employment support was created as a safety net for people who are not eligible to receive unemployment insurance benefits in order to provide comprehensive support to them in relation to vocational training, reemployment and daily life. As a second safety net for people who are not eligible to receive unemployment insurance benefits, an emergency program to support human resource development was implemented to provide such people with free training and give them 100,000 yen per month (120,000 yen in the case of people with a family to support) during the training period, if certain requirements are met.

In addition, in order to promote early reemployment of job seekers who do not have sufficient skills or experiences amid the difficult employment situation, practical training was provided to such people through employment as trainees and other workplace experience so as to enable them to acquire necessary skills and knowledge, and support was also provided to business operators that accepted such people as permanent employees.

Moreover, in order to enhance support for people who had looked for a job for more than one year after leaving their previous job through Hello Work facilities and people who lost both their job and home and faced difficulty continuing job-seeking activity, private-sector job mediation companies were entrusted to provide both employment support and housing and daily life support.

(2) Job training for displaced workers and people looking to change jobs
While employment conditions continue to be harsh, job training is being implemented by consigning training to various kinds of private-sector education and training institutions, such as specialized training schools, universities, NPOs, companies seeking workers, etc., in addition to being implemented at public facilities for the development of vocational capabilities, in order to promote the smooth reemployment of workers, including manufacturing workers who were forced to leave their jobs.

Under the initial budget for fiscal 2009, the maximum acceptable number of trainees was planned to be increased by 35,000 people from the previous fiscal year to 190,000 people. However, under the first supplementary budget for fiscal 2009, that number was increased by an additional 27,000 people to 220,000 people.

3. Matters Related to Cultivation of Infrastructure in the Manufacturing Industry

Promotion of industrial clusters, etc.

(1) Program for promoting regional industrial location (4.386 billion yen)
Under this program, regions drew up basic plans in light of their own characteristics, and the government provided subsidies for projects to realize the plans, including projects to invite companies, develop human resources, and construct plants and other business sites for rental, and a “one-stop service” related to industrial location was provided by the Japan Industrial Location Center. In addition, loans were provided through Japan Finance Corporation in order to facilitate fund-raising for activities to promote industrial location and engagement in advanced business by SMEs.

Regarding measures to make institutional improvements, the Industrial Location Promotion Act was amended to add the ceramic, stone and clay product industries (including the carbon fiber manufacturing industry) to the scope of sectors eligible for a special depreciation measure related to industrial assets in cluster areas in fiscal 2009.
Cultivation of small and medium-sized enterprises

(1) Improvement of subcontracting transactions
   i) Enforcement of the Subcontract Proceeds Act
      In order to make subcontracting transactions more effective and efficient, a written survey was
      conducted on original contracting businesses and subcontracting businesses, and on-site inspections of
      them were implemented based on the Subcontract Proceeds Act. In light of the results of these surveys
      and inspections, recommendations, guidance, written warnings and written guidance for improvement
      were issued.
   ii) Lectures on the Subcontract Proceeds Act
      In order to raise awareness about and promote the implementation of the Subcontract Proceeds Act,
      lectures on the improvement of subcontract transactions were held for officials in charge of outsourcing
      (procurement) at original contracting businesses and subcontracting businesses.
   iii) Guidelines on improvement of subcontracting transactions
      In order to raise awareness about and promote the best practices concerning subcontracting
      transactions, 120,000 copies of the revised edition of a pamphlet listing such best practices were
      printed.
   iv) Consultation centers for subcontractors
      The 48 consultation centers for subcontractors, including the headquarters and regional centers in the
      47 prefectures, provided consultations regarding subcontracting transactions, implemented out-of-court
      dispute settlement procedures and made efforts to raise awareness about and promote guidelines on
      improvement of subcontracting transactions.

(2) Promotion of innovations in management
   The following measures were implemented in order to support innovations in management by SMEs
   intended to significantly improve management through new business activities conducted in quick
   response to changes in the economic environment, such as the development and production of new
   products, the development and provision of new services and the introduction of new methods of
   producing and selling products and providing services.

   i) Loans provided by governmental financial institutions
      Low-interest loans were provided to individual SMEs, associations and voluntary groups implementing
      projects to carry out innovations in management after obtaining approval of their business innovation
      plans based on the Act for the Promotion of New Business Activities by Small and Medium-Size
      Enterprises.
   ii) Special cases related to the Small and Medium-Size Enterprise Credit Insurance Act
      As special cases of the ordinary insurance, unsecured insurance, and small-lot special insurance as
      specified under the Small and Medium-Size Enterprise Credit Insurance Act, support was provided to
      facilitate the supply of funds for projects implemented after approval of business innovation plans based
      on the Act for the Promotion of New Business Activities by Small and Medium-Size Enterprises.
   (iii) Program to develop platform systems for SME management innovation (1.763 billion yen)
      A system constituting the infrastructure of an Internet-based software provider that enables SMEs to
      easily make their business operations efficient at low cost and applications software for financial
      accounting and salary calculations that operate on the system were developed.
   (iv) Regional innovation partnership (813 million yen)
      In order to promote IT-based innovation by SMEs involved in regional services and monodzukuri and
      invigorate local economies, a framework for the promotion of regional innovation partnership was
      established in each broad regional economic bloc in order to hold training sessions and seminars
      across Japan and dispatch experts through a public-private cooperative network (IT-oriented
      management support team), thereby fostering companies that can conduct IT-oriented management. In
      addition, a business matching service was provided to introduce SMEs to regional IT product and
      service vendors that support the use of IT by SMEs, and support was provided to activities to strengthen
      the supply capacity of IT products and services through cooperation between vendors.
4. Matters Related to Promotion of Studies Concerning Manufacturing Infrastructure Technology

Monodzukuri education in school education

(1) Project to support career education suited to each development stage (55 million yen)
Research and surveys were conducted on the development of systematic career education programs suited to each development stage of elementary and junior high school students.

(2) Project to foster personnel that support local industries (335 million yen)
The relevant ministries (METI, MLIT, and the Ministry of Agriculture, Forestry and Fisheries), together with specialized senior high schools and local business circles, implemented initiatives to foster professional workers who protect the culture of manufacturing as well as culinary and everyday life and support local industries.

(3) “Become a specialist (super specialized senior high schools)” project (106 million yen)
A project was implemented in collaboration with universities, research organizations and others to reinvigorate specialized senior high schools through the provision of support for such distinctive initiatives as education that incorporates advanced technologies and skills.

(4) Project to develop human resources with practical skills through industry-academia collaboration (513 million yen)
Educational programs that help to develop human resources with practical skills through industry-academia collaboration at universities and colleges of technology were developed and implemented.

(5) The Vocational Education Promotion Plan to incorporate Specialized Training Colleges and Senior High Schools (147 million yen)
Under the plan, the government, in collaboration with specialized training colleges and senior high schools, provided opportunities for senior high school students to participate in various kinds of work experiences by introducing examples of employment-related knowledge, skills and qualifications to the students and by having them participate in vocational experience workshops. In addition, the plan was intended to foster young people’s job consciousness and motivation to study technology and acquire skills that contribute to monodzukuri by holding vocational experience workshops in various regions.

5. Necessities Related to the Promotion of Other Manufacturing Infrastructure Technology

(1) Project to train economic and industrial human resources (4.212 billion yen)
A training program related to Japanese companies’ technologies and management know-how was implemented for industrial engineers and business managers in developing countries. In fiscal 2009, training was provided in Japan and abroad mainly for employees of SMEs operating in developing countries in Southeast Asia.

(2) 3rd monodzukuri Nippon Grand Award
The monodzukuri Nippon Grand Award is awarded by the Prime Minister to people of various generations involved in monodzukuri, including middle-aged people playing the central role in the manufacturing workplaces, elderly people preserving traditional and culturally important skills and young people set to support the future of the manufacturing industry, who are recognized for their outstanding skills, in order to ensure the continuation and further development of “monodzukuri,” which has underpinned the development of Japanese industries and cultures and has greatly enriched the people’s lives. In the third monodzukuri Nippon Grand Award of fiscal 2009, 50 people and one organization, in a total of 20 cases, was commended by the Prime Minister on July 15, 2009, and eight people who became gold medalists in the International Skills Festival were commended on December 15, 2009.